IDENTIFICATION

PRODUCT CODE: AC-C644B-MC

PRODUCT NAME: CEMKAB0 11/70 MAIN MEMORY DIAG

DATE CREATED: 31-JUL-79

MAINTAINER: DIAGNOSTIC ENGINEERING

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1.0 GENERAL PROGRAM INFORMATION

1.1 Program Purpose (Abstract)

a. Intended for use on all PDP-11/70's and PDP-11/74's including multi-processor multiported MKA11 configurations.

b. This program will be used by system managers and operators to determine the correct operation of main memory and also it will be primarily used by field service and manufacturing to isolate failures to the memory and to isolate failures within the memory to the correct box and array.

c. The object of this software is to functionally test and verify all main memory functions as fast as possible.

d. There is the capability of testing mixed configurations (MJ11 MK11 & MKA11)*on a variable number of CPU's (1-4).

e. This program will functionally test MK11's, MKA11's, & MJ11's.

f. It has special a maintenance mode (Field Service Mode) to provide specific functional capabilities.

1.2 System Requirements

1.2.1 Hardware Requirements -

1.2.1.1 Single Port Tests -

PDP-
11/70 or PDP-11/74 CPU and 64K (16 Bit Words) of Memory

SEU 0005

1.2.1.2 Multiport Tests -

Each CPU must have a KW11L, a IIST, and a Multiprocessor Boot.

The use of the IIST and Multiprocessor Boot may be bypassed via start at 200.

Additionally each system will have the following minimum memory requirements.

# of CPU's	MKA11 Memory
1	64K (16 Bit Words)
2	64K (16 Bit Words)
3	80K (16 Bit Words)
4	96K (16 Bit Words)

There must be no UNIBUS response to UNIBUS Address 752100 thru 752136. If a special device or memory (other than MK11) resides there it must be removed in order to run this diagnostic. The lower 16K of physical memory must have no uncorrectable errors (DBE's).

1.2.2 Software Requirements -

This program is designed to run stand alone or under any of the following monitors:

XXDP
ACT
APT

1.3
Related Documents and Standards

1. PDP-11/70 Processor Handbook

2. PDP-11/70 Processor Handbood

3. MJ11 Maintenance Manual

4. MK11 Maintenance Manual

5. MKA11 Maintenance Manual

6. Pro
gramming Practices (175-003-009-02)

7. System Macro Manual (MAINDEC-11-
DXQAC-C-D)

8. SUPER-MAC Reference Guide (130-380-007-00)

9. AP
T11.MAN (APT/11-317-07-09)

10. ACT11.MAN (AUTOCAT-11-QZAUB-B-D)

1.4 Diagnostic Hierarchy Prerequisites

If the program hangs, dies, goes out
to lunch, heads west, hiccups,
vomits, eats itself, stutters, bombs, or in
any way misbehaves, then:

1. Try it again with Cache off (reference Sec
tion 2.3.3.1)

2. Inhibit relocation (reference section 2.3.1)

3
. Try CPU diagnostics

4. Try Memory Management Diagnostics

5.
Try Cache Diagnostics

6. Try UNIBUS MAP Diagnostics

1.5 Assumptio
ns

This program assumes the correct operation of the CPU, Memory Manage-
me
nt, Cache, and the UNIBUS Map. This program occupies (initially)
Bank 0 (0-
16K). The XXDP loaders are in bank 1.

2.0 OPERATING INSTRUCTIONS

2.1 Loading & Starting Procedures

2.1.1 Quick Starting -

1. Load address 200
2. Set switch register for options (normally
0)
3. Start

2.1.2 Stopping -

1. Set SW8. or
2. Type control "C" (Reference section 2.3.4.1).

2.1.3 Restarting
(Preserve Configuration Table) -

1. Load address 202
2. Set s

witch register for options (Normally 0)

SEQ 0010

3. Start

2.1.4 Starting (W
ith Multiprocessor and NO IIST or Boot) -

1. Load address 204

2. Set switch register for options (Normally 0)

3. Start

2.1.
5 Switch Register Options -

SWITCH	USE
15	HALT ON ERROR
14	LOOP ON TEST
13	INHIBIT ERROR TYPEOUTS
12	INHIBIT RELOCATION
11	QUICK VERIFY / INHIBIT MARGIN TESTING
10	BELL ON ERROR
9	LOOP ON ERROR
8	HALT PROGRAM (UNRELOCATED & RESTORE LOADERS)
7	DETAILED ERROR REPORTS
6	PRINT CONFIGURATION MAP
5	LIMIT MAX ERRORS PER BANK
4	FAT TERMINAL (132 COLUMNS OR BETTER)
3	TEST MODE - SEE DOCUMENT
2	TEST MODE - SEE DOCUMENT
1	TEST MODE - SEE DOCUMENT
0	DETECT SINGLE BIT ERRORS

2.2 Special Environments

2.2.1 XXDP -

The first pass will be a quick verify pass if and only if it is in chain mode.

2.2.2 ACT & APT Automatic Mode -

The program will not create double bit errors (DBE's) after the 1st pass.

The first pass will be a quick verify pass

2.2.3 NO SBE Free Banks -

If the program cannot find any SBE (Single Bit Error) free locations (in non-protected MK11 memory) it will print out an error message and continue testing by-passing the CSR tests.

2.2.4 Mixed Core & MOS Configurations -

The program will function normally in mixed environments. The sequence of testing may seem strange due to the recursive test mode algorithm (reference sections 2.3.1.1, 2.3.1.2, & 2.3.1.3).

2.3 Program Options

2.3.1 Switch Register Details -

If a hardware switch register is not available then the software swit
ch register is in location 176. IF under APT if BIT7 is set in the E-TABLE
symbolic location '$ENVM' the APT software switch register will be used (locati
on $SWREG).

To change the software switch register contents: Type "control G".
This will cause display the current value of the SWR and prompt for t
he octal input of the new SWR value from the terminal. This routine will ign
ore you (not respond to control 'G') if you have a hardware switch register.

SW15 - HALT ON ERROR
(100000)

Conti
nuing from this halt will first check for a change in the softwa
re switch register ("Control G" in the TTY input buffer) then it
will continue testing.

SW14 = LOOP ON TEST
(40000)

This will cause looping on the present test or patern
(back to last scope trap). If in a pattern then the
looping will be for an entire bank of 16K addresses.

SW13 = INHIBIT
ERROR TYPEOUTS
(20000)

This will cause returns from the error routine without
the typed messages. Other on error functions are not

affected.

Sw12 INHIBIT REL
OCATION

(10000)

This prevents the program from
moving and consequently
prevents the program from testing at l
east 16K of memo-
ry - in the case of MK11 memory up to 128K o
f memory
may be bypassed because of PROTECTION POINTER coverag
e
(reference section 5.2.4).

SW11 - QUICK VERIFY/INHIB
IT MARGIN TESTING
(4000)

Each pass of the diag
nostic normally runs all margins
and checks all combinations
of SBE's & DBE's. If this
switch is selected no margins are run
(shortening pat-
tern tests by a factor of 5) and approximatel
y one 64th
of the possible combinations of SBE's & DBE's are tes
t-
ed.

Each pass complete typeout will indicat
e this mode by
preceding the pass number with 'QV".

SW10
BELL ON ERROR
(2000)

This causes a bel
l (or beep or click) on each error
trap

SW9 LO
OP ON ERROR
(1000)

This will cause looping fro
m failure point back to the
last correctly initialized area
of the current test.
This loop will frequently be too large for
scoping pur-
poses. Tighter loops are provided for in Field Ser
vice
Mode reference section 2.3.4.5.10.

SW8 = HALT P
ROGRAM
(400)

This initiates the following sequ
ence:

1. clears margins in 'MAINT" REGISTER

2. if program is relocated it moves back to bank

zero

3. flush out all possible DBE's.

4. turns off memory management

5. restore l
oaders

6. unmap the Unibus Map

7.
Halt if under APT or ACT branch sel.

SW7 - DETAILED ERROR REPORTS
(200)

After any normal error report is typ
ed this option
causes the contents of the following registe
rs to be
typed:
R0, R1, R2, R3, R4, R5, SP, 'ME
MERR', 'MAINT', 'CON-
TROL', 'LOADRS', 'HIADRS', 'CPUERR'

S
W6 - PRINT CONFIGURATION MAP
(100)

Th
is prints a map showing the memory configuration -
reference
section 7.4.

SW5 - LIMIT MAX ERRORS PER BANK
(40)

This will limit the number of error typeouts per bank.
The default is 10. DECIMAL, however this can be
changed by changing location 'ERRMAX' manually or with
OTT (Ref-
erence Section 2.3.4.2).

SW4 - FAT TERMINAL
(20)

This informs the program that the console terminal has
a width of at least 132 columns (LA36 with wide paper).

SW3-1
TEST MODE

Test modes determine the recursion algorithm to be used during pattern tests.

MODE	NAME	DESCRIPTION
(0)	0	BAFPAF Banks forward, patterns forward
(2)	1	BAFPAR Banks forward, patterns reverse
(4)	2	BAWPAF Banks worst first, patterns forward.
(6)	3	BAWPAR Banks worst first, patterns reverse.
(10)	4	PAFBAF Patterns forward, banks forward
(12)	5	PAFBAW Patterns forward, banks worst first
(14)	6	PARBAF Patterns reverse, banks forward
(16)	7	PARBAW Patterns reverse, banks worst first.

NOTE: Margins follow patterns

Forward is (0,2,3,4,5)
Reverse is (5,4,3,2,0)

For more details reference section 2.3.1.1 and 2.3.1.2.

SW0 DETECT SINGLE BIT ERRORS (SBI's)
(1)

For manufacturing purposes this switch should always be on. For field service purposes this switch should always be off.

This switch will allow all MK11 Single Bit errors to be reported by disabling error correction.

Error p

rintouts of SBE's are not distinguishable from DBE's.

SFO 30'1

2.3.1.
Test Mode Example -

Example analysis of mode 5 'PAFBAW'. Assume Banks 0
& 1 are MJ11
(core) and Banks 2,3,4,& 5 are MK11 (MOS).

Assume also tha
t Bank 3 is known bad by the program (via the sizing
routine or previous ru
ns reference section 3.1 and 6.1 test 22). The
testing sequence would be as fo
llows:

```
;TEST MK11 MEMORY TYPES FIRST
;TEST KNOWN BAD MEMORY (BANK 3)

PAT
TERN 17,        BANK 3,         MARGIN 0
PATTERN 17,     BANK 3,         MARGIN 2
PATTERN 17,     BANK 3,
MARGIN 3
PATTERN  7,     BANK 3,         MARGIN 0
PATTERN  7,     BANK 3,         MARGIN 2
PATTERN
 7,     BANK 3,          MARGIN 3
PATTERN  1,     BANK 3,         MARGIN 0
PATTERN  1,     BANK 3,         MARGI
N 2
PATTERN  1,     BANK 3,         MARGIN 3
PATTERN  2,     BANK 3,         MARGIN 0
PATTERN  2,     B
ANK 3,          MARGIN 2
PATTERN  2,     BANK 3,         MARGIN 3
PATTERN  4,     BANK 3,         MARGIN 0
PATTERN  4,     BANK 3,         MARGIN 2
PATTERN  4,     BANK 3,         MARGIN 3
PATTERN  5,     BANK 3
                MARGIN 0
PATTERN  5,     BANK 3,         MARGIN 2
PATTERN  5,     BANK 3,         MARGIN 3
PATTE
RN 21,  BANK 3,          MARGIN 0
PATTERN 21,     BANK 3,         MARGIN 2
PATTERN 21,     BANK 3,         MA
RGIN 3
PATTERN 20,     BANK 3,         MARGIN 0
PATTERN 20,     BANK 3,         MARGIN 2
PATTERN 20
        BANK 3,          MARGIN 3
PATTERN 22,     BANK 3,         MARGIN 0
PATTERN 22,     BANK 3,         MARGIN
2
PATTERN 22,     BANK 3,         MARGIN 3
```

```
PATTERN 26.     BANK 3.         MARGIN 0
PATTERN 26.     BAN
K 3.            MARGIN 2
PATTERN 26.     BANK 3.         MARGIN 3

;TEST PRESUMED GOOD MEMORY (BA
NKS 2,4,5)

PATTERN 17.     BANK 2.         MARGIN 0
PATTERN 17.     BANK 2.         MARGIN 2
PAT
TERN 17.        BANK 2.         MARGIN 3
PATTERN 17.     BANK 4.         MARGIN 0
PATTERN 17.     BANK 4.
MARGIN 2
PATTERN 17.     BANK 4.         MARGIN 3
PATTERN 17.     BANK 5.         MARGIN 0
PATTERN
17.     BANK 5.         MARGIN 2
```

```
PATTERN 1,      BANK 5,         MARGIN 3
PATTERN  7,     BANK 2,         MARG
IN 0
PATTERN  7,     BANK 2,         MARGIN 2
PATTERN  7,     BANK 2,         MARGIN 3
PATTERN  7,
BANK 4,         MARGIN 0
PATTERN  7,     BANK 4,         MARGIN 2
PATTERN  7,     BANK 4,         MARGIN 3

PATTERN  7,     BANK 5,         MARGIN 0
PATTERN  7,     BANK 5,         MARGIN 2
PATTERN  7,     BANK
5,              MARGIN 3
PATTERN  1,     BANK 2,         MARGIN 0
PATTERN  1,     BANK 2,         MARGIN 2
PATT
ERN  1, BANK 2,         MARGIN 3
PATTERN  1,     BANK 4,         MARGIN 0
PATTERN  1,     BANK 4,         M
ARGIN 2
PATTERN  1,     BANK 4,         MARGIN 3
PATTERN  1,     BANK 5,         MARGIN 0
PATTERN
1,      BANK 5,         MARGIN 2
PATTERN  2,     BANK 5,         MARGIN 3
PATTERN  2,     BANK 2,         MARGIN
 0
PATTERN  2,     BANK 2,         MARGIN 2
PATTERN  2,     BANK 2,         MARGIN 3
PATTERN  2,     BA
NK 4,           MARGIN 0
PATTERN  2,     BANK 4,         MARGIN 2
PATTERN  2,     BANK 4,         MARGIN 3
P
ATTERN  2,      BANK 5,         MARGIN 0
PATTERN  2,     BANK 5,         MARGIN 2
PATTERN  2,     BANK 5,
                MARGIN 3
PATTERN  4,     BANK 2,         MARGIN 0
PATTERN  4,     BANK 2,         MARGIN 2
PATTER
N  4,   BANK 2,         MARGIN 3
PATTERN  4,     BANK 4,         MARGIN 0
PATTERN  4,     BANK 4,         MAR
GIN 2
PATTERN  4,     BANK 4,         MARGIN 3
PATTERN  4,     BANK 5,         MARGIN 0
PATTERN  4,
        BANK 5,         MARGIN 2
PATTERN  4,     BANK 5,         MARGIN 3
PATTERN  5,     BANK 2,         MARGIN 0

PATTERN  5,     BANK 2,         MARGIN 2
```

```
PATTERN  5,      BANK 2,          MARGIN 3
PATTERN  5,      BANK
 4,              MARGIN 0
PATTERN  5,      BANK 4,          MARGIN 2
PATTERN  5,      BANK 4,          MARGIN 3
PAT
TERN  5,         BANK 5,          MARGIN 0
PATTERN  5,      BANK 5,          MARGIN 2
PATTERN  5,      BANK 5,
MARGIN 3
PATTERN 21,      BANK 2,          MARGIN 0
PATTERN 21,      BANK 2,          MARGIN 2
PATTERN
2',      BANK 2,          MARGIN 3
PATTERN 21,      BANK 4,          MARGIN 0
PATTERN 21,      BANK ',          MARGI
N 2
PATTERN 21,      BANK 4,          MARGIN 3
PATTERN 21,      BANK 5,          MARGIN 0
```

```
PATTERN 21,
BANK 5,          MARGIN 2
PATTERN 21,      BANK 5,          MARGIN 3
PATTERN 20,      BANK 2,          MARGIN 0

PATTERN 20,      BANK 2,          MARGIN 2
PATTERN 20,      BANK 2,          MARGIN 3
PATTERN 20,      BANK
4,               MARGIN 0
PATTERN 20,      BANK 4,          MARGIN 2
PATTERN 20,      BANK 4,          MARGIN 3
PATT
ERN 20, BANK 5,          MARGIN 0
PATTERN 20,      BANK 5,          MARGIN 2
PATTERN 20,      BANK 5,          M
ARGIN 3
PATTERN 22,      BANK 2,          MARGIN 0
PATTERN 22,      BANK 2,          MARGIN 2
PATTERN 2
2,       BANK 2,          MARGIN 3
PATTERN 22,      BANK 4,          MARGIN 0
PATTERN 22,      BANK 4,          MARGIN
 2
PATTERN 22,      BANK 4,          MARGIN 3
PATTERN 22,      BANK 5,          MARGIN 0
PATTERN 22,      BA
NK 5,            MARGIN 2
PATTERN 22,      BANK 5,          MARGIN 3
PATTERN 26,      BANK 2,          MARGIN 0
P
ATTERN 26,       BANK 2,          MARGIN 2
PATTERN 26,      BANK 2,          MARGIN 3
PATTERN 26,      BANK 4,
                 MARGIN 0
PATTERN 26,      BANK 4,          MARGIN 2
PATTERN 26,      BANK 4,          MARGIN 3
PATTER
N 26,   BANK 5,          MARGIN 0
PATTERN 26,      BANK 5,          MARGIN 2
PATTERN 26,      BANK 5,          MAR
GIN 3


;RELOCATE  TEST PROGRAM SPACE (BANK 0 & 1)

PATTERN  1,      BANK
0,               MARGIN 0
PATTERN  1,      BANK 0,          MARGIN 2
PATTERN  1,      BANK 0,          MARGIN 3
PATT
ERN  1, BANK 0,          MARGIN 4
PATTERN  1,      BANK 0,          MARGIN 5
PATTERN  2,      BANK 0,          M
```

```
ARGIN 0
PATTERN  2,     BANK 0,          MARGIN 2
PATTERN  2,     BANK 0,          MARGIN 3
PATTERN
2,      BANK 0,          MARGIN 4
PATTERN  2,     BANK 0,          MARGIN 5
PATTERN  3,     BANK 0,          MARGIN
 0
PATTERN  3,     BANK 0,          MARGIN 2
PATTERN  3,     BANK 0,          MARGIN 3
PATTERN  3,     BA
NK 0,           MARGIN 4
PATTERN  3,     BANK 0,          MARGIN 5
PATTERN  4,     BANK 0,          MARGIN 0
P
ATTERN  4,      BANK 0,          MARGIN 2
PATTERN  4,     BANK 0,          MARGIN 3
PATTERN  4,     BANK 0,
                MARGIN 4
```

```
PATTERN  4,      BANK 0,          MARGIN 5
PATTERN  5,      BANK 0,          MARGIN 0
PATTE
RN  5,  BANK 0,          MARGIN 2
PATTERN  5,      BANK 0,          MARGIN 3
PATTERN  5,      BANK 0,          MA
RGIN 4
PATTERN  5,      BANK 0,          MARGIN 5
PATTERN 26,      BANK 0,          MARGIN 0
PATTERN 26
,        BANK 0,          MARGIN 2
PATTERN 26,      BANK 0,          MARGIN 3
PATTERN 26,      BANK 0,          MARGIN
4
PATTERN 26,      BANK 0,          MARGIN 5
PATTER:  ,       BANK 1,          MARGIN 0
PATTERN  1,      BAN
K 1,             MARGIN 2
PATTERN  1,      BANK 1,          MARGIN 3
PATTERN  1,      BANK 1,          MARGIN 4
PA
TTERN  1,        BANK 1,          MARGIN 5
PATTERN  2,      BANK 1,          MARGIN 0
PATTERN  2,      BANK 1,
        MARGIN 2
PATTERN  2,      BANK 1,          MARGIN 3
PATTERN  2,      BANK 1,          MARGIN 4
PATTERN
  2,     BANK 1,          MARGIN 5
PATTERN  3,      BANK 1,          MARGIN 0
PATTERN  3,      BANK 1,          MAR
GIN 2
PATTERN  3,      BANK 1,          MARGIN 3
PATTERN  3,      BANK 1,          MARGIN 4
PATTERN  3,
        BANK 1,          MARGIN 5
PATTERN  4,      BANK 1,          MARGIN 0
PATTERN  4,      BANK 1,          MARGIN 2

PATTERN  4,      BANK 1,          MARGIN 3
PATTERN  4,      BANK 1,          MARGIN 4
PATTERN  4,      BANK
 1,              MARGIN 5
PATTERN  5,      BANK 1,          MARGIN 0
PATTERN  5,      BANK 1,          MARGIN 2
PAT
TERN  5,         BANK 1,          MARGIN 3
PATTERN  5,      BANK 1,          MARGIN 4
PATTERN  5,      BANK 1,
MARGIN 5
PATTERN 26,      BANK 1,          MARGIN 0
PATTERN 26,      BANK 1,          MARGIN 2
PATTE N
26,      BANK 1,          MARGIN 3
```

PATTERN 26, BANK 1, MARGIN 4
PATTERN 26, BANK 1, MARGI
N 5

SEQ 0027

NOTE

This is an exam
ple & not an actual se-
quence.

The pattern sequence was
forward (the simple patterns first, complex
patterns last) sequence of patte
rns (MK11 = 17, 7, 1, 2, 4, 5, 21, 20,
22, 26)(MJ11 = 1, 2, 3, 4, 5, 26).

Si
nce the patterns were forward so were the margins (0,2,3,4,5).

If the pattern
s were run in reverse (MK11=26,22,20,21,5,4,2,1,7,17)
(MJ11=26,5,4,3,2,1,)
then the margins would also have been in reverse
(5,4,3,2,0)

If the bank sel
ection is forward the banks will be tested in the fol-
lowing order:

1
. MK11 banks that are not protected or program space (from 0 to
167).

2. MJ11 banks that are not program space (from 0 to 167).

3.
The program now relocates & tests:

4. MK11 banks that were protected or
program space (from 0 to
167).

5. MJ11 banks that were pr
ogram space (from 0 to 167).

If bank selection is worst first the configurati
on table will be con-
sulted and banks will be tested in the following order.

1. MK11 banks that are known bad and are not protected or pro-

gram space (from 0 to 167).

2. MJ11 banks that are known bad and ar
e not program space (from
0 to 167).

3. MK11 banks that are p
resumed good and are not protected or
program space (from 0 to 167)
.

4. MJ11 banks that are presumed good and are not program space (from 0 to 167).

5. The program now relocates & tests:

6. MK11 banks that are known bad and were protected or program space (from 0 to 167).

7. MJ11 banks that are known bad and were program space (from 0 to 167).

8. MK11 banks that are presumed good and were protected or program space (from 0 to 167).

9. MJ11 banks that are presumed good and were program space (from 0 to 167).

2.3.1.2 Test Mode Details -

MODE 0 = 'BAFPAF'' banks forw
ard, patterns forward

This is the default and simplest mode.

This mode tests each bank completely from 0 to 167 ex-

cept those requiring relocation*.

While testing each
bank the patterns are run with the
simple ones first building
to the more complex.

MODE 1 - 'BAFPAR'' = banks forward, patterns revers
e

This mode tests each bank completely from 0 to 167 ex-

cept those requiring relocation*.

While testing ea
ch bank the patterns are run with the
most complex ones first,
working to the simple ones.

MODE 2 - 'BAWPAF'' = Banks worst first, pat
terns forward

This mode first tests each known bad bank com
pletely
from 0 to 167 except those requiring relocation*, then

presumed good banks are tested from 0 to 167 except

those requiring relocation*.

While testing each bank t
he patterns are run with the
simple ones first, building to th
e more complex.

MODE 3 - 'BAWPAR'' - Banks worst first, patterns reverse

This mode first tests each known bad bank completely

from 0 to 167 except those requiring relocation*, then

presumed good banks are tested from 0 to 167 except those requiring relocation*.

While testing each bank the patterns are run with the most complex ones first, working to the simple ones.

MODE 4 - 'PAFBAF' = Patterns forward, banks forward

This mode tests each pattern completely with the simpler ones first, building to the more complex.

While testing each pattern the banks are run from 0 to 167 except those requiring relocation*.

MODE 5 'PAFBAW' = Patterns forward, banks worst first

This mode tests each pattern completely with the simple ones first, building to the more complex.

While testing each pattern first each known bad bank from 0 to 167 except those requiring relocation* is run, then presumed good banks are run from 0 to 167 except those requiring relocation*.

MODE 6 - 'PARBAF' - Patterns Reverse, Banks Forward

This mode tests each pattern completely with the most complex ones first, working to the simple ones.

While testing each pattern the banks are run from 0 to 167 except those requiring relocation*.

MODE 7 'PARBAW' - Patterns Reverse, Banks Worst First

This mode tests each pattern completely with the most complex ones first, working to the simple ones.

While testing each pattern first each known bad bank from 0 to 167 except those that require relocation* is run, then presumed good banks are run from 0 to 167 except those requiring relocation*.

NOTE

* Relocation is required to test the bank(s) in program space and also to test any MK11 banks protected by diagnostic checkmode with the inhibit mode

pointer off (zero):

SEQ 0033

2.3.1.3 'e
of Mode Applications -

1. To verify correct operation of the memory system use Mode 0 'BAFPAF''.

Advantages: Easy to understand.

Disadvantages: In case of a failing Bank, it may take a long time to find the failure.

2. To get detailed error information on known bad Banks (found by sizing routine) use Mode 2 'BAWPAF''.

Advantages: Seeks Bad Banks. Easy to understand.

Disadvantages: Failures other than zeros & ones may take a long time to find.

3. To get good error info on any memory problem fast use Mode 4 'PAFBAF''.

Advantages: Covers all banks fast. Easy to understand.

Disadvantages: Failures from only complex patterns may take a long time to find.

4. To find any problem fast use Mode 7 'PARBAW''.

Advantages: Covers all Banks fast.

Disadvantages: Difficult to understand failures reported are not necessarily the most basic failure modes.

2.3.2 Display Register -

A software displ
ay register exists in location 174 in addition to any
hardware display existen
ce.

Display fields are as follows:

```
       15 : 14  13  12  11  10   9   8
 ! 7   6   5 ! 4   3   2   1
relocated !          Bank  #          !  Margins  .    P
attern
          !                           !          .
=============================== ==========-===
==================
                                OR
```

In the case of multiprocessor tests the ent're displ
ay register is
used to represent the two's compliment of the multiprocessor tes
t #.

PATTERN # The number of the pattern presently being run. All

patterns are described in section 6.2. Any pattern can be
found in the Di
agnostic by Looking up the symbolic Tags
'MTONN' and 'MTPNN' - where 'NN'
is the Pattern number.
MTONN refers to the routine that sets up for the test

Pattern whereas MTPNN is the actual pattern itself.

NOTE

The pattern # is not necessarily an in-

dication of degree of difficulty.

MARGINS The 3 bit
value loaded into the Maintenance register
(17777750) Bits (3:1). Margins
are decoded as follows:

Margin	MJ11(core)	MK11(MOS)
0	Normal Operation	Normal Operation
2	Early Strobe	Early MDR L

	3	Late Strobe	Late Refresh
	4	Low Current	Reserved
(Normal)			
	5	High Current	Reserved (Normal)

Margin 1 = Forces "wrong address parity" error

BANK = The number of the Bank (16K) of memory under test (0-167).
These bits directly map to physical address bits (21:15).
If the Bank # is above 167 octal this entire display is in Multiprocessor mode - see above.

RELOCATED = This BIT indicates that the program is relocated and no longer in Bank 0. It will be relocated to the first known good non-protected memory bank indicated on the configuration map (reference section 7.4).

2.3.3 Special Memory Locations -

2
.3.3.1 CACHE Constant -

The CACHE constant is located at symbolic location
"CACHK" and is used
to enable CACHE.

If you desire to run with group 0 disab
led change this CACHE constant
to 4 or 5, if you desire to run with group 1 di
sabled change the CACHE
constant to 10 or 11, if you desire to disable all of C
ACHE change the
CACHE constant to 14 or 15.

NOTE

Bit 0 in the CACHE constant has no ef-

fect since it is unconditionally set by
the program whenev
er it tries to enable
CACHE.

2.3.3.2 Configuration Table

The configuration table is located at symbolic location ''CONFIG'' and
h
as the following format:

```
CONFIG:  First 16K Configuration words (3 each)
         2
nd   16K Configuration words (3 each)
         .......................
         167th 16K
configuration words (3 each)

Configuration Words:
                LOW:    BIT 0-2   INTERLEA
VE FACTOR
                        BIT 3     EXTERNAL INTERLEAVE
                        BIT 4     MASTER CAN ACCESS (MEMORY
EXISTS)
                        BIT 5     SLAVE #1 CAN ACCESS (SHARED)
                        BIT 6     SLAVE #2 CAN ACCESS
 (SHARED)
                        BIT 7     SLAVE #3 CAN ACCESS (SHARED)
                        BIT 8-10  BOX NUMBER (0-7
)
                        BIT 11    ERRORS PRESENT
                        BIT 12    PROTECTED REGION OF A MK11 BOX
                        BI
T 13-14 MEMORY TYPE;0 MJ11;1=MK11
                        BIT 15    PROTECTED (PROGRAM SPACE)
                MED:
        BIT 0-5   NOT USED
                        BIT 6-8   MK11 CSR ADDRESS
                        BIT 9-11  NOT USED
                        BI
T 12      INTERNAL INTERLEAVE
                        BIT 13    ''BACKGROUND PATTERN VALID'' FLAG
                        BIT
14        BANK SELECTED FOR TEST BY FIELD SERVICE MODE
                        BIT 15    LOADERS HOME BANK

                HIGH:   BIT 0     INDICATES BANK IS ADDRESSED BY CSR 172100
                        BIT 1     INDICATE
S BANK IS ADDRESSED BY CSR 172104
                        BIT 2     INDICATES BANK IS ADDRESSED BY CSR
 172110
                        BIT 3     INDICATES BANK IS ADDRESSED BY CSR 172114
                        BIT 4     INDICA
TES BANK IS ADDRESSED BY CSR 172120
                        BIT 5     INDICATES BANK IS ADDRESSED BY C
SR 172124
                        BIT 6     INDICATES BANK IS ADDRESSED BY CSR 172130
                        BIT 7     INDI
```

CATES BANK IS ADDRESSED BY CSR 172134
BIT 8-15 NUMBER OF ERRORS

This ta
ble is used as the source for the configuration
Map (reference. section 7.4).

2.3.4 Terminal Commands -

2.3.4.1 Control "C" -

This command will
:

1. Clear any margin conditions.

2. Unrelocate if program was
relocated.

3. Flush out any DBE's.

4. Turn off Memory managem
ent.

5. Attempt to Boot RK05 Drive 0.

6. Failing 5, attempt to
Boot RK05 Drive 1.

7. Failing 6, go to 5.

This command will only be
recognized at the completion of the current
test or pattern.

2
.3.4.2 Control "D" (Debug) -

This command will enter a modified version of
ODT.

This is a subset of the ODT as documented in the RT11 System Reference
Manual with the addition of Control "C", Control "F", & control "E"
which fu
nction as outlined here.

NOTE

It is advisable not to enter ODT when
the program is re
located.

2.3.4.3 Control 'E' (procEEd) -

This command will allow you
to exit ODT. It is the reverse of the
control 'D' command. If you typ
e control 'E' after a Breakpoint -
you're on your own!

2.3.4.4 Control
'T' (Tell me what's happening) -

This command will print out the information
encoded in the display re-
gister. This is mainly intended for CPU's without
a hardware display
register.

Example:

RELOCATED BANK- 23 MAR- 3 PAT= 26

2.3.4.5 Control 'S' (Stop) -

This command will stop typeout (soon) a
nd will wait for a Control 'Q'.

2.3.4.6 Control 'Q' (Quintinue) -

Th
is command will continue typing that has been stopped by Control
'S'. If
there has beer no Control 'S' typed then this command is ig-
nored.

2.3.4.7
Control 'F'' (Field service mode) -

This command will cause you to enter a mo
de Looking for sub commands.

When the program is looking for a sub command an
y number that is not a
legal command will cause a mini help message to be typ
ed. Therefore
when in doubt type 99 (CR) and you will get help.

NOTE

Typing just carriage return is a
default
command 0.

2.3.4.7.1 Field Service Command 0
(Exit) -

This command will exit Field Services Mode and return to whatever
task
it was in prior to typing control 'F''. Note typing just carriage re-
tu
rn is a default 0.

2.3.4.7.2 Field Service Command 1 (Read CSR) -

Th
is command will typeout the contents of the MK11 CSR.

If there is more than o
ne CSR on the CPU (or if the program has not
yet determined the CSR status
yet), it will Ask you ''WHICH CSR(0-7)''
to which you must respond with an Octal
number from 0 to 7. Note typ-
ing just carriage return is a default 0.

If
the CSR you select causes a trap to 4 the program will type ''THIS
CSR DOES NO
T EXIST''.

NOTE

SEQ 0043

CSR refer
ences are done in accordance
with section 5.1.

2.3.4.7.
? Field Service Command 2 (Load CSR) -

This command will enable you to load
the MK11 CSR.

If there is more than one CSR on the CPU (or if the program
has not
yet determined the CSR status yet) it will ask you 'WHICH CSR(0-7)'' to

which you must respond with an Octal number from 0 to 7. Note typing
just c
arriage return is a default 0.

If the CSR you select causes a trap to 4 the p
rogram wi'l type 'THIS
CSR DOES NOT EXIST''.

The CSR will be read and dis
played as in command 1.

The program will then ask you for the 'FIRST CSR WORD
'' to which you
must respond with an Octal number. Note typing just carria
ge return
is a default 0.

The program will then ask you for the ''2ND CSR WOR
D'' to which you must
respond with an Octal number.

The program will then l
oad the CSR and Read it again displaying its
new contents.

2.3.4.7.4
Field Service Command 3 (Examine Memory) -

This command will allow you to e
xamine any physical address and does
the necessary memory management mapping
for you.

The program will ask you for the 'PHYSICAL ADDRESS (0-16777776)''
to
which you must respond with an Octal number.

If the address access causes
a trap to 4 the program will type 'TIME-
OUT TRAP''. If the address acces
s causes a trap to 114 the program
wil type 'PARITY ABORT''.

The contents of
your physical address will be typed.

2.3.4.7.5 Field Service Command 4 (Modify Memory) -

This command allows you to modify any physical address and does the necessary memory management mapping for you.

The program will ask you for the "PHYSICAL ADDRESS (0-16777776)" to which you must respond with an Octal number.

If the address access causes a trap to 4 the program will type "TIME-OUT TRAP". If the address access causes a trap to 114 the program will type "PARITY ABORT".

The program will type "OLD DATA WAS" and the contents of your physical address.

The program will then type "INPUT NEW DATA" to which you must respond with an Octal number. Note typing just carriage return is a default 0.

The program will attempt to write this new data into your physical address after which it will read it again and type "DATA IS NOW" and the new contents of your physical address.

NOTE

If you can't change the data, that would indicate that you have a double bit error in that double word pair.

2.3.4.7.6 Field Service Command 5 (Select Bank, Margin & Pattern) -

This command allows you to run any bank at any margin with any pattern
forever.

The program will ask you 'BANK(0-167)'' to which you must respond with
an Octal number. If the bank is not accessible. The program will

type 'BANK NOT ACCESSIBLE'' and ask question over.

The program will then ask
'PATTERN (0-37)'' to which you must respond
with an Octal number.

Any
pattern can be run including those that are not part of the

A
PT E-TABLE defaults (reference section
6.2.1). If you select Pattern 0, the
program will ask 'PATTERN 0 DATA IS?'' to

'.. which you must respond with an Octal
number.

The program will then ask 'MARGIN (0,2,3,4,5)?'' to which you must respond
with an Octal number of the set (0,2,3,4,5). If SW5 is set in
the Switch register the program will type 'MARGINS INHIBITED BY SW5''
and ask you for the
margin again. You must then either turn off SW5
or select a margin of 0.

If
the Bank you selected requires relocation the program will type
'BANK REQUIRES RELOCATION'' and exit this command. Note normally this
is true for Bank 0
.

The program will then arm the console keyboard for interrupts and type
'TO
ESCAPE TYPE ANY KEY.''.

The test pattern will be entered and run until a console key is de-

pressed to escape this loop.

2.3.4.7.7 Field Service Com
mand 6 (Type Configuration Map) -

This command types the configuration map.

This is useful after a long run (overnight) to see all the banks that
are m
arked as bad. (Especially if your console is a video terminal).

For a detail
ed explanation of the map reference section 7.4.

2.3.4.7.8 Field Service
Command 7 (Battery Backup Test) -

This command will check that memory does
not forget while powered
down.

It will write and check the address pat
tern in every non-protected
Memory Bank.

It will then prompt with 'REMOVE
SYSTEM POWER FOR 10 SECONDS MAX!".

If you change your mind and do not wish t
o power down the system type
any character and the program will think that it
has gone thru a power
fail/auto restart sequence.

The program will then read
check each non-protected bank for the ad-
dress pattern and when done typ
e 'TEST COMPLETE" and exit this com-
mand.

2.3.4.7.9 Field Service Co
mmand 8 (SOB-A-LONG TEST) -

This command allows execution of the SOB-A
-LONG Test on all
non-protected Banks reference Section 6.2.2.26. Operat
ion is identi-
cal to command 5 except that no Pattern or Bank is entered and
each
pass causes a Bell.

2.3.4.7.10 Field Service Command 9 (Super Tight s
cope loop) -

This command allows super tight scope loops on any physical
address
with any margin setting.

The program will ask for "PHYSICAL ADDRESS"
to which you must respond
with an octal number.

The program will then ask
"MARGIN (0,2,3,4,5)?" to which you must res-
pond with an Octal number of th
e set (0,2,3,4,5). If SW5 is set in
the Switch register the program will type
"MARGIN INHIBITED BY SW5"
and ask you for the margin again. You must then
either turn off SW5
or select a margin of 0.

The program will then type "SW
R ---> MEM,MEM ---> DISPLAY" indicating
that it will move the switch register
into the physical address, move
the physical address into the Display Register
, and loop.

The the program arms the console keyboard for interrupts and type
s "TO
ESCAPE TYPE ANY KEY!".

The program now enters a loop at symbolic loca
tion "CMD9LOOP" which
consists of the following code:

```
CMD9LOOP:       MOV     @SWR,(
R0)     ;WRITE SWITCH REGISTER INTO MEMORY
                MOV     (R0),@DISPLAY   ;READ MEMORY INTO DI
SPLAY REGISTER
                BR      CMD9LOOP        ;LOOP TILL KEYBOARD INTERRUPT
```

Typing any key w
ill exit this command.

2.3.4.7.11 Field Service Command 10 (Error Summary)
-

This command types out the number of passes and the total number of
e
rrors. If there were any errors it will type out the Banks and the
number of
errors per bank up to 255 DECIMAL.

This becomes useful after long runs (all
night) on systems with a
video console terminal.

2.3.4.7.12 Fiel
d Service Command 11 (Refresh TEST) -

This command allows execution of the R
efresh Test on all non-protected
Banks reference Section 6.2.2.19. Operation i
s identical to command 5
except that no Pattern or Bank is entered and each pas
s causes a Bell.

2.3.4.7.13 Field Service Command 12 (Set Fill Count) -

This command allows setting of the terminal fill count (necessary for
LA30
's, ASR33's, and VT05's). It is normally set to zero for LA36's,
VT52's, VT61
's, etc.

2.3.4.7.14 Field Service Command 13 (Enter Kamikaze Mode) -

This command allows you to run patterns that are normally not executed
unles
s under APT or ACT. They are usually very time consuming and can
result in fai
lures that are fatal to the program. In effect you are
trying to find a
hardware failure regardless of the consequences.
Note that most crashes do not
wipe out the display information which
is telling you what the program
was doing just prior to failure.

There are two ways to die here - Impatience a
nd Crashes.

2.3.4.7.15 Field Service Command 14 (Exit Kamikaze Mode) -

Return to the default mode of testing (undo Command 13).

2.3.4.7.16 Fi
eld Service Command 15 (Turn Cache Off) -

This changes the Cache constant to
bypass cache (reference section
2.3.3.1).

2.3.4.7.17 Field Servi
ce Command 16 (Turn Cache On) -

This changes the Cache constant to use
cache (reference section
2.3.3.1).

2.3.4.7.18 Field Service Command
17 (Run Only Multiport Tests) -

Single Port Testing will be disabled. This
is used to extensively
test only logic that is unique to the Multiporcesso
rs.

2.3.4.7.19 Field Service Command 18 (Resume Running Both Single
and
Multiport Tests) -

Return to the default mode of testing (undo Command
17).

•

2.3.4.7.20 Field Service Command 19 (Test Only Selected Banks) -

This command allows you to center the test effort on only those banks
that
you are troubleshooting. You may also test banks that require
relocation a
nd were inaccessable via command 5.

2.3.4.7.21 Field Service Command 2

C (Resume Testing All Banks) -

SEQ 0054

Return to the default mode of testing (undo C
ommand 19).

2.4 Execution Times

2.4.1 Typical (System) -

Execut
ion time depends on many variables however here are some meas-
ured times.

	CEMKAB(70 MEM)	DEMJA (OLD 0-2 MEG)
128K of MJ11 (core) Memory		
Normal Pa ss	2 Min 45 Sec	11 Min 41 Sec
Quick Verify	33 Sec	2 Min
1 28K of MK11 (MOS) Memory		
Normal Pass	2 Min 52 Sec	11 Min 41 Sec
Quick Ve rify	45 Sec	2 Min
Kamikaze Mode	29 Min	
Kamikaze QV Sec	9 Min 35	

2.4.2 Calculations (System) -

Normal Pass (all margins)
Add
14 Sec per MK11 Box (CSR)
Add 20 Sec per BANK of MOS
Add 21 Sec per BANK of
Core

Quick Verify Pass
Add 5 Sec per BANK of MOS
Add 4 Sec per BANK o
f Core

Kamikaze Mode
Multiply above times by 10.

2.4.3 Typical (Pattern
s) -

Pattern	Time	Description
MT0000	;<1 SEC	DATA PATTERN TEST
MT0001	;<1 SEC	ADDRESS TEST
MT0002	;<1 SEC	COMPLEMENT AD
DRESS TEST		
MT0003	; 1 SEC	3 XOR 9 WORST CASE NOISE TEST
MT0004	; 1 SEC	ROTAT
ING ZEROS TEST		
MT0005	; 1 SEC	ROTATING ONES TEST
MT0006	;<1 SEC	INITIAL DATA
TEST		
MT0007	;<1 SEC	ADDRESS BIT TEST
MT0010	;<1 SEC	BYTE ADDRESSING TEST
M		
T0011	;<2 SEC	CREATE SINGLE BIT ERROR TEST
MT0012	;<1 SEC	WRITE BYTE CLEARS S
BE TEST		
MT0013	; 1 SEC	CREATE DOUBLE BIT ERROR TEST
MT0014	; 1 SEC	WRITE INH
IBIT DURING DATIP WITH DBE		
MT0015	; 1 SEC	WRITE INHIBIT OF BYTE WITH DBE
MT00		
16	;<1 SEC	WRITE INHIBIT OF WORD WITH DBE
MT0017	;<1 SEC	HOLDING 1'S 0'S TES
T		
MT0020	;<1 SEC	MARCHING 1'S 0'S IN CHECK BITS
MT0021	; 1 SEC	MARCHING 0'S
1'S TEST		
MT0022	;10 SEC	REFRESH TEST
MT0023	;10 SEC	SHIFTING DIAGONAL TEST
MT0024	;20 SEC	FAST GALLOPING PATTERN TEST
MT0025	;<1 SEC	INTERRUPT ENABLE
TEST		
MT0026	;<1 SEC	RANDOM DATA TEST
MT0027	; 1 SEC	UNIQUE BANK TEST
MT0030		
	; 1 SEC	FLUSH OUT DBE'S TEST
MT0031	; 3 SEC	SOB-A-LONG TEST
MT0032	;<1 SEC	SKEWED UP ADDRESS TEST
MT0033	;<1 SEC	WRITE RECOVERY TEST
MT0034	;35 SEC	BR
ANCH GOBBLE TEST		
MT0035	;<1 SEC	SOFT ERROR TEST

'. ERROR INFORMATION

3.' Error Reporting

Most errors are reported using the EMT trap and h
andler provided by
SYSMAC.SML. Most errors will be of the 'MEMORY DATA ERROR
'' type which
will be described here. MEMORY DATA ERRORS will also cause the
bank
to be marked as Bad in the configuration table.

Other errors are best e
xplained by referencing the specific typeout
and if necessary the program li
sting.

Example:

```
MEMORY DATA ERROR
  PC     BANK  VADD      PADD      GOOD      B
AD       XOR  MAR BOX MTYPE INT PAT ARRAY
022132    37  060006  03700006  000000  0
00100  000100  0   0   MK11  0   06  15
022132    37  060006  03700006  000000  0
00100  000100  0   0   MK11  0   06  15
022132    37  060006  03700006  000000  0
00100  000100  0   0   MK11  0   06  15
022132    37  060006  03700006  000000  0
00100  000100  0   0   MK11  0   06  15
```

While testing Bank 37 at virtual addr
ess 60006 (virtual addresses are
always between 60000 and 157776 for mappin
g purposes), physical ad-
dress 3700006 (that's Bank 37 physical 6 within the B
ank) with Pattern
6 (Initial Data Test), the good data expected was 0 but the d
ata actu-
ally read (BAD) was 100, the exclusive OR at Good & Bad yields 10
0
which indicates only failing bit(s) (Bit 6). The margins were at 0
(no m
argin) and the memory resides in Box 0, it is an MK11 (MOS) Memo-
ry and its i
nterleave factor is 0 (not interleaved). The CSR identi-
fied an error in slot
A1 (reference Section 7.6).

NOTE

Subsequent errors of the same test do
not type a ne
w heading.

The Box Interleave and slot would be a "?" if the memory type wa
s MU11
(Core).

If an MU11 (Core) gives Parity Aborts then the Bad Data & XOR
will be
"??????".

If no MX11 has no CSR with a SBE or DBE then slot will b
e a "-".

3.2 Error Abbreviations

The following is a list of all abbreviations used in error reports.

# Of ERRORS	Number of Errors that were detected.
1ST ADD	First Address that failed.
ARRAY	The array number that was locked up in the MK11 CSR.
APT#	The # of CPU's APT expects on the system.
APTCORE	APT Core size.
APTMOS	APT MOS size.
BAD	Bad data.
BAD-WD1	Bad Word #1 of a double word data value.
BAD-WD2	Bad Word #2 of a double word data value.
BAD-CHK	Bad Check Code Bits.
BANK	The Bank number. Banks are 16K words long.
BD-CC	Bad Check Code Bits.
BDSWITCH	Bad Switch setting in binary.
BOX	The number of the Box in the system. MJ11 boxes have no numbers.
CHKBITS	The 7 bit value of the Check Code Bits.
CONTRL	The CACHE Control register.
CPUERR	CPU Error register.
CSR	Control and Status Register.
CSR+2	The 2nd half the the MK11 double word CSR.
CSRNUM	CSR NUMBER (0-7).
DBE	Double Bit Error (uncorrectable error).
DEV ADD	Device Address.
ECC	Error Correction.
GD-CC	Good Check Code Bits.
GD-CHK	Good Check Code Bits.
GD-WD1	Good Word #1 of a double word data value.
GD-WD2	Good Word #2 of a double word data value.
GDSWITCH	Good Switch setting in binary.
GOOD	Good data.
HIADRS	High Address error register.
IIST	Inter-processor Interrupt and Sanity Timer.
INT	Interleave total including internal and external.
INTRLV	Interleave total including internal and external.

```
LOADRS          Low Address error register.
MAINT           Maintenance register.
MAR             M
argin.  Bits 5-1 of the PDP-11/70 Maintenance Register.
MASTER          The Master CPU.

MEMERR          Memory Error register.
MJSIZE          MJ11 Size.
MKSIZE          MK11 Size.
MMR0
Memory Management Register #0.
MMR1            Memory Management Register #1.
MMR2            Memo
ry Management Register #2.
MMR3            Memory Management Register #3.
MTYPE           Memory
Type (MJ11 or MK11).
PADD            Physical Address (asserted by the program after mapp
ing).
PAT             Pattern number.
PC              Program Counter at the time the error occurred.

REAL#           The # of CPU's actually on the system.
SBE             Single Bit Err.r (correcta
ble error).
SLAVE#          The Slave CPU Number.
SLAVE1          The 1st Slave CPU.
SLAVE2
The 2nd Slave CPU.
SLAVE3          The 3rd Slave CPU.
VADD            Virtual Address (asserted
by the program before mapping).
```

WROTE1 The data that was written into the 1st half of a double word.

WROTE2 The data that was written into the 2nd half of a double word.

XOR Exclusive OR of the good and bad data. Shows the bad bits.

3.3 Error Halts

There are several Halts in the program.

All unused tra
p vectors contain a trap catcher (.WORD .+2,HALT).

An undefined TRAP instruct
ion halts at symbolic location '$HALT2''.

The APT down load sequence will halt
 at symbolic location ''APTHLT''.

Slave CPU's that did not get permission from
the master CPU to proceed
will halt at symbolic location ''SHALT''.

If any CPU
 detects that multiple CPU's are assuming master status then
that CPU will hal
t itself at symbolic location ''MHALT1'', ''MHALT2'', or
''MHALT3''.

Halt on Error
 option (SW15 Set) at symbolic location ''$HALT''.

Halt program (SW8 Set) at sy
mbolic location ''$EXHALT''.

Power Fail will normally halt at the end of the
shut down sequence
(symbolic location ''$DOWN'').

Power Fail has a fatal Hal
t at symbolic location ''$ILLUP'' which can be
caused by power up occurring bef
ore power down sequence completed or
by power down before a power up sequence i
s completed.

4.0 PROGRESS REPORTS

Pass complete typeouts as follows:

END PASS	#	1
END PASS	#	2
END PASS	#QV	3

NO'E

Pass 2 was flagged as a Quick Verify

SEQ 0063

Pass. (Because of a change in SW5)

5.0 DEVICE INFORMATION TABLES
(CSR's)

1st Word

```
15  !  14  13  12  11  10   9   8  .   7   6   5
 4    . 3     ! 2   ! 1    . 0
DBE !   Check/Syndrome/Capacity     .   Bad array
  ! SBE !Protect!DIAG ! ECC ! ENA

      .     !Pointer!CHECK! DIS . PAR
                                  !
          .     !       .     !     . TRAP
```

2nd Word

```
15  !  1
4  13  12  11  !  10          !  9    !  8  7  6  5  4  3  2  1  0
DBE ! Interl
eave       !Interleave or . Bad    .  Starting Address
    !                  !S
tarting Add  .control.
    !                  !   Load       !       .
```

5.1
Address(s) Of The CSR

The CSR is accessed as a 32-bit word on the 11/70 m
ain memory bus.
(To the processor, the CSR looks like two consecutive 16 bit
words.)

A switch on the M8158 address buffer module selects one of two option
s
for CSR address access, either Direct or Indirect.

5.1.1 Direct Addre
ss

(For this option the 11/70 processor requires modification.) Switches

on the M8158 address buffer module select one of the following eight
CSR (do
uble word) locations (octal addresses):

177772100
177772104
177772110
1777
72114
177772120
177772124
177772130
177772134

5.1.2 Indirect Address

(No 11/70 modifications required for this option but its use is quite
c
omplex.) Switches on the M8158 address buffer module select one of
the follo
wing eight CSR (double word) locations (octal addresses):

17772100
17772104

17772110
17772114
17772120
17772124
17772130
17772134

NOTE

These addresses are in the upper 128
x
word section of the existing 11/70 2M
word
address space. Normally this is
reserved address space never
implemented
in memory and not directly accessible by

the processor.

However, these CSR locations may be accessed for dia
gnostic purposes
through the unibus map with cache turned off. It is not re
commended
to use this method in an operating system environment since the unibu
s
map is required if other NPR activity is present. One cookbook method
of im
plementing a CSR access (within this diagnostic program) is:

1. Halt al
l NPR activity on the system.

2. Turn cache off.

3. Par 6 <---
177400 (other Par's Normal)

4. Enable memory management in 22 bit mode
.

5. Map 36 <--- 17760000 (other Maps - 0).

6. Turn on Unibus
Map.

7. Access virtual 152100 through 152136 as CSR's.

5.1.2 1 His
torical Note -

This Indirect path to the CSR's was discovered in early 197
7 by an
expedition consisting of my three brothers and myself.

Field Servi
ce Engineer, Memory Engineer, System Engineer, and myself
Software Engineer,
departed the CPU on our search for the CSR's.
Memory Engineer promised th
at CSR's would conditionally reside in the
shadow of a giant memory depen
ding on whether or not they felt
switched.

We began our search for the fi
rst CSR believing that if we found one,
that the rest of the tribe would
surely be nearby. Our task was
clear, find CSR 17772100 behind the giant memo
ry 0 through 16777776 (2
Meg words).

Field Service Engineer suggested that s
ince we could arrive in the
east by heading west, then surely we could f
ind 17772100 by heading
for 152100. This didn't make too much sense to my othe
r brothers and
myself, however, since Field Service was willing to pay for the
exped-
ition, we all left CPU city in search of 152100.

The first village w
e came upon was managed by an old experienced relo-
cator named Kay Tee. We t
old Mr. Tee of our expedition and our high
expectations of finding 17772100 by
looking for 152100. He expressed
doubt that the feat could be accomplished,
but he said since our three
most significant bits were six that perhaps his mo
st trusted friend
Six (on of the Par brothers) could help us. So we proce
eded to see
Six Par.

We found Six Par at a busy highway control center dir
ecting traffic
with his brothers. He greeted us warmly and assured us that
we had
come to the right place. Six said that his older brother Seven was

not to be trusted since he preferred devices to people. Also, Six told us how his younger brothers were much too inexperienced to guide us and that they usually only do 1 to 1 relocations. So, at Six Par's highway we were given 177400 which he said to muitiply by 64 and add to our 12100 (152100 less 3 MSB's). Thus, we were leaving Kay Tee's village with a total address of 17752100.

At the outskirts of the village there were two toll gates one to Cash and one to Uni. We decided to take the Cash route at System Engineer's suggestion that "Cash makes no enemies". However, the gate guard would not let us pass because he thought we were a device. We tried to explain but he insisted that unless our most significant bits were 16, we could not pass. Reluctantly, we decided to try the Uni gate. Here the guard was more negotiable and he let us pass charging only four bits. Just outside the gate we boarded a Unibus with address 752100.

The bus trip was supposed to be quite long .
 with many stops, however,
it turned out the first stop was the last stop f
or anybody without a
device address. Here we departed the Unibus to find a lon
g row of 36
checkout girls at special registers called Maps. Each Map regi
ster
had a number 0 through 36 and a checkout girl with a matching bust
si
ze. We all agreed to visit Map register 36. The checkout girl was
very cordi
al and went on to say that she preferred customers whose
most significant f
ive bits were 36 also. She charged us our five most
significant bits and added
 her favorite number 17760000 to our address
of 12100 and we departed with 1777
2100, which Memory Engineer promised
would lead to the CSR.

Next we came to
the cash highway, but since the cash register was
turned off, we were
declared amiss and allowed to pass all the way
down the highway toll free where
 we arrived at the Memory bus. We
gave the driver our address of 17772100
and proceeded on our way. The
driver warned us that no one ever goes there and
 he waited for us at
our stop as it was not a regular part of his route.

H
ere waiting at the bus stop with open arms, we found the CSR and the
entire tr
ibe. We briefly exchanged data and climbed back on the Memo-
ry bus as we had
to return to CPU city before the last Unibus timed
out.

The journey home
was without incident. It is interesting to note that
once home none of the en
gineers including myself, could remember what
the checkout girl's face looked l
ike.

5.1.3 Indirect Manual Mode: -

1. Turn off Cache 17777
746 <--- 4

2. Set up MAP0 17770200 <--- 170000

17770202 <--- 77

3. Turn on Unibus Map 17772516
<--- 40

4. Turn display switch to CONS PHY

5. Examine or
deposit 17002100 through 17002136 as CSR's

5.2 Allocation of CSR Bits

5.2.1 Enable Parity Traps (Bit0 - of 1st Word) -

If this bit is set, it allows bad parity to be asserted (for a READ operation) if a double error occurs or a single error occurs with ECC disabled. Section 5.2.5 summarizes the operation of this bit along with other control bits. This bit is set on power up and can be written or read by the main memory bus.

5.2.2 ECC Disable (Bit1 - 1st Word) -

If this bit is set, the error correction circuits are disabled and no single bit error correction will occur. However, error detection circuitry is enabled and any single or double bit error may still be detected on a READ operation and correct check bits are still written into memory on a write operation.

This is a diagnostic aid to allow writing and reading data from memory without interference from the error correction logic. This is a READ/WRITE bit cleared on power up.

5.2.3 Diagnostic Check (Bit2 - 1st Word) -

This mode allows a means of writing data stored in CSR Bits (14:8) into the MOS chips used for check bit storage. A READ cycle to memory will read the check bits from MOS storage into CSR bits (14:8).

This allows an integrity check on the check bit storage chips and a

ne ... on the error correction logic.

... bit ... s ... eared on power up and can b
e written or read by the main
memory bus.

5.2.4 Protection Pointer (Bit3 - 1
st Word) -

This bit selects the 16K section of memory which will be prot
ected
(not be affected by ECC disable and diagnostic check). This 16K sec-
t
ion will contain the diagnostic program. When this bit is unassert-
ed, the
first 16K associated with each control card is protected.
When this bit is
asserted the second 16K associated with each control
card will be protected.
This is a READ/WRITE bit cleared on power up.

5.2.5 Summary of Bits(3:
0) of 1st Word -

CSR	BIT3	BIT2	BIT1	BIT0	FUNCTION
	0	0	0	0	Par
ity trap, disable (Normal Mode)
	0	0	0	1	Enable traps on DBE's (Initialized Val
ue from power up)
	0	0	1	0	Disable error correction traps
	0	0	1	1	Enable tra
ps on SBE's
	0	1	0	0	R/W cneckbits
	0	1	0	1	Not used by program
	0	1	1	0	Not
used by program
	0	1	1	1	Not used by program
	1	0	0	?	Read Box Capacity in Bit
s (14:8) of 1st word
	1	0	1	0	Disable error correction traps (Program relocate
d)
	1	0	1	1	Enable traps on SBE's (Program relocated)
	1	1	0	0	R/W Checkbits (
Program relocated)
	1	1	0	1	Not used by program
	1	1	1	0	Not used by program
	1	1	1	1	Not used by program

? DON'T CARE

5.2.6 Single Bit Erro
r Indication (Bit4 - 1st Word) -

On a READ cycle to memory, if a single bit
error occurs, this bit is
set. Simultaneously, the syndrome bits are la
tched into CSR Bits
(14:8) and the array identification and controller se
lected are
latched into CSR (Bits [7:5] 1st word) and Bit9 2nd word.

An exa
mination of tne CSR can thus be performed to see if a single bit
error had oc
curred and the array that failed if such error occurred.
This is a READ/WRITE b
it cleared on power up.

5.2.7 Array Select (Bits (7:5) 1st Word) -

During a READ cycle to memory, latched address bits on the selected
control
board will be stored in these locations upon an error. Any
DBE will rewrit
e these bits & SBE's from protected memory will not be
latched.

5.2.8 Che
ck Bit/Syndrome Bit Storage/Box Capacity (Bits (14:8) 1st
Word) -

5.2.8.1 Check Bit Storage (DIAG CK = 1) -

During a diagnostic check, bits a
re read from or written into memory
as described in Section 5.2.3.

5
.2.8.2 Syndrome Bit Storage -

If a single bit error occurs on a read cycle,
then the syndrome bits
indicating what bit failed are stored into those CSR
bits.

These CSR bits can be written or read by the main memory bus.
They are
neither set nor reset on power up.

5.2.8.3 Hamming Code Matrix -

Each ch
eck bit (C1-C32) is the result of odd parity generated on the
data bits desig
nated by X.

C1 = f(1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31)
C2 = f(2
,3,6,7,10,11,14,15,18,19,22,23,26,27,30,31)
C4 = f(4-7,12-15,20-23,28-31)
C8
= f(0-15,24-31)
C16= f(0-7,16-31)
C32= f(8-31)

Check bit CT (check total
) is the result of even parity generated on
the data bits.

CT = f(0,3,5,
6,8,11,13,14,16,19,21,22,25,26,28,31)

Syndrone bits (S1-ST) are formed by a
comparison of the check bits
read from memory and new check bits generat
ed on the data read from
memory.

A single error will cause an odd number of
syndrome bits to go high.
If Bit 4 should fail S16, S8, & S4 would be set.

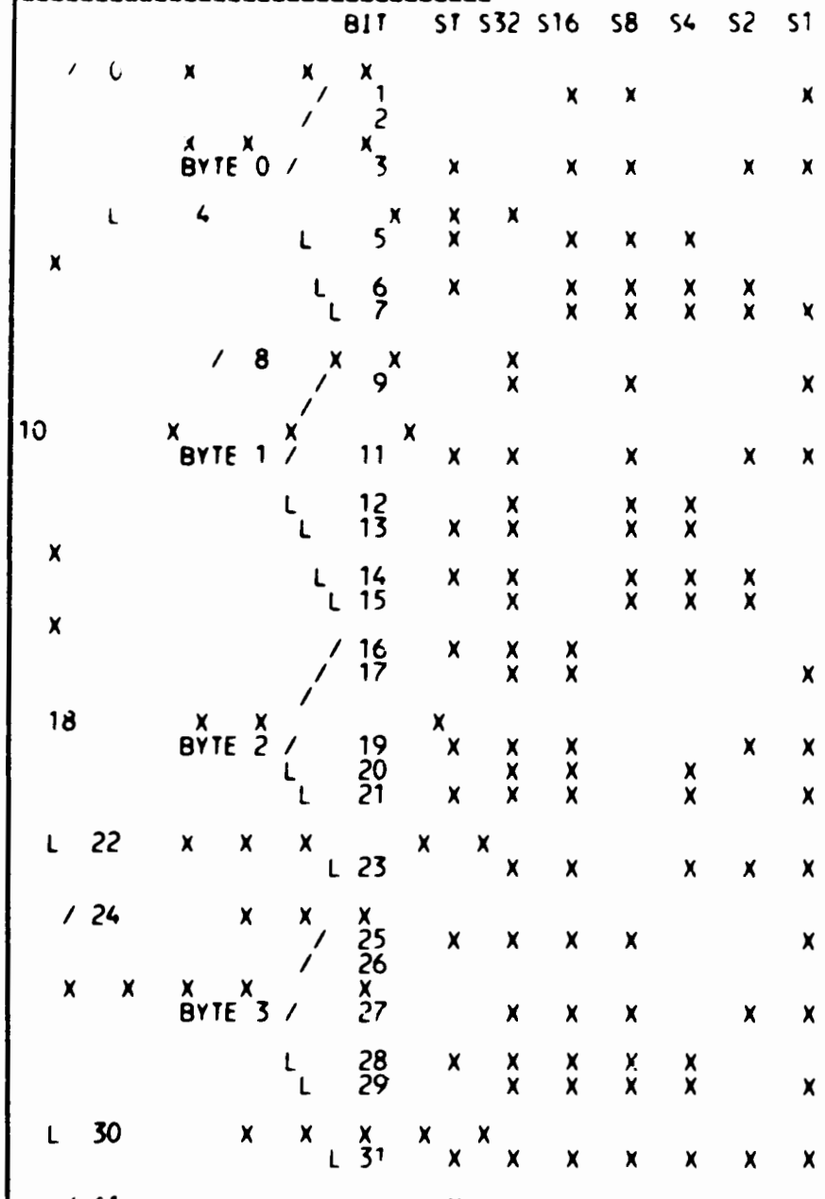
An examination of the syndrome bits can disclose the failing bit.

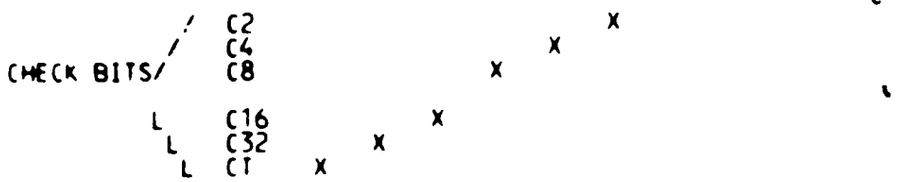
If there a
re more than one syndrome bits set and still an odd number
of bits then the
following simplification exists. S4-S1 indicate in
octal the failing Bit (0-7
). S32-S8 indicate the Bad Byte. The
cleared bit in S32-S8 indicates wh
ich Byte from left to right. S32-S8
= 3 = Byte 0; 5 = Byte 1. 6 = byte 2; a
nd all set = 7 - Byte 3. ST
(Syndrome total) should be set or cleared to prod
uce an odd number of
syndrome.

If only one syndrome bit is set it directly i
ndicates which check bit
is bad.

If an even number of syndrome bits are set
 something is wrong with the
hardware.

SYNDROME BITS




C2
C4
CHECK BITS
C8
C16
C32
CT

5.2.8.4 Box Capacity
-

Multiplexed with the locations for reading and/or writing check bits
or
reading syndrome bits is the ability to read the total number of
16K X 32 s
ections (double blocks) in memory. In order to read this
box capacity, th
e special code as indicated in Section 5.2.5 (bits
(3:1) = 1,0,0) will have t
o be loaded into the CSR 1st word prior to
performing the READ cycle.

(Not
e that if ECC is manually disabled, writing a Zero into CSR Bit2
1st word i
s overridden and a One remains. In order to read the box
capacity for this ca
se, an internal flip-flop is used whose state is
what was written into CSR
Bit2 1st word. Hence writing Bits(3:1) -
1,0,0 1st word will still allow box
capacity to be read even though
CSR BIT2 1st word is still a One.)

5.2.9 Double Error Indication (Bit 15 of 1st or 2nd Word) -

On a READ cycle
, these bits are set if a double error occurs.
Simultaneously the arr
ay select bits latched on the control board se-
lected are stored into CSR Bits
(7:5) 1st word and the latched control
is stored in Bit 9 2nd word. It should
be noted that Bits 15 of 1st &
2nd word are separate and independent. Clearin
g one bit via a write
to that byte will not affect the other. They are howe
ver asserted by
the addressed controller simultaneously. These are READ/WRIT
E bits
reset on power up.

5.2.10 Starting Address (A24-A16) (Bits (8
:0) 2nd Word) -

These bits are used to load a starting box address through t

he CSR on
a WRITE cycle or can be used to read the starting address of the mem SEQ 0082
o-
ry box if the address is set by switches on the data interface card or
remo
tely from the processor. The starting address can be reconfigured
on a 32K wor
d segment. These bits are READ/WRITE. On power up the
switch settings on
the data interface card are loaded into these CSR
locations. In order to load
the starting address Bit 10 2nd word must
accompany the load.

5.2.11
Control Select (Bit 9 2nd Word) -

If a single or double bit error occurs du
ring a READ cycle, then the
address of the controller selected is stored in t
nis CSR bit location.

This bit is read only and cleared on power up.

5.2.
12 Starting Address Selector (Bit 10 2nd Word) -

This bit controls selectio
n of the starting address & External Inter-
leave loaded into the CSR or the
starting address and external inter-
leave dictated by the switches on the data
buffer board or control
panel. A Zero in this bit indicates selection of
the switches, a One
indicates selection of the starting address loaded into CS
R bits (8:0)
2nd word and External Interleave bits (14-12) 2nd word!

(Note t
hat a READ operation to the CSR will always give the actual box
starting addres
s in Bits (8:0) 2nd word regardless of its origin.)

This is a READ/WRITE bit
cleared on power up. (However, a switch on
the data buffer board can hold th
is bit cleared, thereby defeating any
attempt at loading the starting addre
ss and External Interleave
through the CSR.)

5.2.13 Internal Inter
leaving (Bit 11 2nd Word) -

This bit indicates if there is internal interlea
ving within a memory
box. If this bit is cleared there is no internal inter
leaving and if
it is set, there is internal interleaving.

NOTE

Only if each controller has identic
al
memory capacity is this bit capable of
bein
g set. However, writing a Zero to
this bit disables all poss
ible internal
interleaving. This is a READ/WRITE bit

set on power up if each of the two control card sets has identical memory capacity.

SE0 0084

5.2.14 External Interleaving (Between Boxes) (Bits (14:11) 2nd word) -

These bits indicate how the system is configured for external interleaving as follows:

BIT14	BIT12	BIT13	NUMBER OF WAYS EXTERNALLY INTERLEAVED
0	0	0	No External Interleaving
1	0		
	0	Not Used	
0	1	0	2 Way: Memory Responds to Even Double Words
1			
1	0	:	Memory Responds to Odd Double Words
0	0	1	4 Way: Memory Selected If: A02 0; A03 0
1	0	1	: Memory Selected If: A02=1; A03=0
0	1	1	: Memory Selected If: A02=0; A03=1
1	1	1	: Memory Selected If: A02-1; A03=1

The bits will be treated in a similar manner to the Start Address as described in Section 5.2; i.e., CSR Bit10 2nd word will determine the origin. Also, on power up the corresponding switch settings will be loaded into these CSR bit locations.

5.2.15 Interleave Summary -

BIT14	BIT13	BIT12	BIT11	DESCRIPTION
0				
0	0	0	No Interleave	
0	0	0	1	Internal 2-1
0	0	1	0	External 2-1 Even Double Words
0	0	1	1	Ext 2-1 Int Even Double Words
0	1	0	0	Ext 4-1 A3=0 A2=0
0	1	0	1	Ext 4-1 INT A3=0 A2=0
0	1	1	0	Ext 4-1 A3=1 A2=0
0	1	1	1	Ext 4-1 Int A3=1 A2=0
1	0	0	0	Impossible (ERROR)
1	0	0	1	Impossible (ERROR)
1	0	1	0	Ext 2-1 Odd Double Words
1	0	1	1	Ext 2-1 Int Odd Double Words
1	1	0	0	Ext 4-1 A3-0,A2-1

1	1	0	1	Ext 4-1 Int A3=0,A2=
1	1	1	0	Ext 4-1 A3=1,A2=1
1	1	1	1	Ext 4-1 Int A3=1,A2=1

5.3 CSR Bit Summary

CSR BIT ALLOCATION - AS
DESIGNED COMMENTS

1st word Bit
0 Enable Parity Traps : Set on Power Up (Read/Write)
Bit1 ECC Disable :
(lear on Power Up (R/W)
Bit2 Diagnostic Check : Clear on Power Up (R/W)

Bit3 Protection Pointer : Clear on Power Up (R/W)
Bit4 Single Bit Error Ind
ication : Clear on Power Up (R/W)
Bit5 Array Sel A01 : Clear on Power Up
(Read Only)
Bit6 Array Sel A02 : Clear on Power Up (Read Only)
Bit7 Arr
ay Sel A03 : Clear on Power Up (Read Only)
Bit8 CK Bit1/Syndrome 1/Capacit
y 1 : (Read/Write) Bits, Neither
Bit9 CK Bit2/Syndrome 2/Capacity 2 : Set n
or Reset on Power
Bit10 CK Bit4/Syndrome 4/Capacity 4 : Up; Based on CSR Bit
2 bit3 CheCK
Bit11 CK Bit8/Syndrome 8/Capacity 8 : Bits Alone are Read from
or
Bit12 CK Bit16/Syndrome 16/Capacity16 : Written into these locations

Bit13 CK Bit32/Syndrome 32/Capacity32 : Otherwise Syndromes are Written on SBE'
s
Bit14 CK Bit T/Syndrome T/Capacity64
Bit15 Double Bit Error Indication
: Clear on Power Up (R/W)
2nd word Bit0 Start Address (A16) : (Read/Write) B
its Capable of
Bit1 Start Address (A17) : Being Loaded via the Main Data

Bit2 Start Address (A18) : Bus or Switches on the Data
Bit3 Start Address
(A19) : Card. On Power Up, the switch
Bit4 Start Address (A20) : Settings
are loaded into
Bit5 Start Address (A21) : These Locations.
Bit6 Start
Address (A22)
Bit7 Start Address (A23)
Bit8 Start Address (A24)
Bit9 Co
ntroller Select : Cleared on Power Up (Read Only)
Bit10 Start Address Selec
tor : Loaded on Power Up (Read/Write)

Bit11 Internal Interleaving : Loade
d on Power Up (Read/Write)
Bit12 Two Way : Loaded Same as Bits (8:0) 2nd
word
Bit13 Four Way : Loaded Same as Bits (8:0) 2nd word
Bit14 Ext A02
: Loaded Same as Bits (8:0) 2nd word
Bit15 Double Bit Error Indications :
Clear on Power Up (R/W)

6.0 SUB-TEST SUMMARIES

6.1 Tests

TEST 1

ANALIZE CONFIGURATION
(CSR Access may cause wrong Type of Traps)

TEST 2

TEST BANK 0 ACCESSES
Failures are fatal.

TEST 3

TEST
BANKS 1-167 (OCTAL) FOR ZEROS ONES
Errors are not typed here - only logged i
n
the configuration table

TEST 4

MK11 PROTECTION POINTER TEST

TES
T 5

DIAGNOSTIC MODE DISPATCH ROUTINE
This test runs all the patterns in t
he
mode selected.

TEST 6

UNIQUE BANK TEST
Pattern 27 is run

TES
T 7

FORCE ADDRESS PARITY ERRORS
Insures that no bank responds when there
is
an address parity error.

6.2 Patterns

6.2.1 General Patter
n Information -

Actual patterns are identified by symbolic locations 'MTPXYY
'' where X
may be any sub program indicator (A,B,C,etc) or 0 and YY will be t
he
number of the pattern.

Setup procedures for each pattern are identified b
y symbolic locations
'MTOOYY'' where YY will be the number of the pattern.

Pa
tterns reside in 4 scripts that are scanned for execution. Symbolic
location
'MKCSRT'' is a table of patterns that can run once for each
MK11 controller (t
wice per MK11 Box). Symbolic location 'MKPAT'' is a
table of patterns that ca
n run on each Bank of MK11 memory. Symbolic
location 'MJPAT'' is a table of pat
terns that can run on each Bank of
MJ11 memory. Symbolic location 'FSPAT''
is a table of patterns that
can be run in Field Service Mode (command 5).

T
he 1st 3 scripts are completely controlled by the APT E-table (even
if not
running under APT). Modifications to this table can be made
(1) with APT, (2)
manually, or (3) with ODT reference Section 2.3.4.2.

Example E-table Segmen
t:

```
;THE FOLLOWING LOCATIONS SPECIFY WHICH PATTERNS
;ARE TO BE RUN FOR PARTI
CULAR MEMORIES
;
;REFERENCE THE TABLE LISTED BELOW TO RELATE BITS TO PATTERNS.

;BIT0 SET WILL RUN THE FIRST ENTRY IN THE TABLE, BIT0 SET
;IN THE SECOND WORD
WILL RUN THE 17TH ENTRY IN THE TABLE...
;
;NOTE**NULL TESTS DO NOT TAKE ANY T
IME
```

```
;
$DDW0:  .WORD   177777  ;MK11 CSR TESTS         TABLE - MKCSRT:
$DDW1:  .WORD   17777
;       ;MK11 CSR TESTS         TABLE - MKCSRT:
$DDW2:  .WORD   177777  ;MK11 PATTERNS          TABLE -
MKPAT:
$DDW3:  .WORD   177777  ;MK11 PATTERNS          TABLE   MKPAT:
$DDW4:  .WORD   177777
.MJ11 PATTERNS          TABLE = MJPAT:
$DDW5:  .WORD   177777  ;MJ11 PATTERNS          TABLE = MJPA
T:
```

6.2.2 Specific Patterns -

6.2.2.1 Pattern 0 Basic Data Test -

Writes & Reads R2 into a 16K Bank.

This is used for Zeros and Ones testing and in Field Service Mode for any console selected pattern.

It executes out of the USER Instruction PAR's.

NOTE

It is frequently modified dynamically such that (1) it returns after writing only (the 1st NOP is replaced with a RETURN) or (2) it only counts Errors (the code PERR02 and NOP are replaced with INC @#PATERR)

.

6.2.2.2 Pattern 1 Address Test -

Writes & Reads an incrementing pattern equivalent to physical addressed into a 16K Bank.

It executes out of the USER Instruction PAR's.

6.2.2.3 Pattern 2 Complement Address Test -

Writes the complement of the physical address from high addresses to

low (write down) and reads from low addresses to high (read up).

SEQ 0095

This provides the complement of the coverage of Pattern 1 in both data pattern and addressing sequence.

It executes out of the USER Instruction PAR's.

6.2.2.4 Pattern 3 3 XOR 9 -

Writes & Reads a pattern that complem
ents as address bits 4 and 10
change. This is because the PDP-11/70 fetch
es double words therefore
a classical 3 XOR 9 in a small PDP-11 must look like
a 4 XOR 10 in a
PDP-11/70.

This pattern is run 4 times (1) with Zeros & On
es, (2) with Ones &
Zeros, (3) with 401 & Ones, and (4) with Ones & 401.
The pattern of
the 401 is to force a the parity bits to become involved.

It
executes out of the USER Data PDR's, the User Instruction PAR's,
the Kernel
Data PAR's and the Supervisor Data PAR's.

6.2.2.5 Pattern 4 Rota
ting Zeros Test -

Writes a background pattern of Ones. Rotates a Zero Carr
y Bit left
thru each par of bytes (18 times) and then checks that the carr
y is
Zero and the word (2 bytes) is still all Ones.

It executes out of the U
ser Data PAR's and the Kernel Data PAR's.

NOTE

It is not uncommon to observe the good

data equal to the bad data. This indi-
cates that the carry wa
s not clear after
18 ROLB's.

6.2.2.6 Pattern 5 Rotat
ing Ones Test -

Writes a background pattern of Zeros. Rotates a One carry
bit left
thru each pair of bytes (18 times) and then checks that the Carry is
a
One and the Word (2 Bytes) is still all Zeros.

This provides the compleme
nt of the coverage of Pattern 4 in data.

It executes out of the User Data PAR
's and the Kernel Data PAR's.

NOTE

It is not uncommon to observe the good
data equal t
he bad data. This indicates
that the Carry was not set afte
r 18
ROLB's.

6.2.2.7 Pattern 6 Initial Data Test -

Writes & Reads a double word first with all bits 0 except 1 (for every bit
position), Second with all bits 1 except 1 (for every bit posi-
tion).

Th
is is a very quick check of the data paths.

6.2.2.8 Pattern 7 Add
ress Bit Test -

Writes a background of all Zeros.
Read Address 1 for a 0 By
te.
Complement Address 1.
Read Address 1 for a non 0 Byte.
For each Address B
it position from Bit 1:
Virtual (2, 4, 10, 20, 40, 100, 200, 400, 1000, 2000,
4000, 10000,
60000, 20000)
Physical (60002, 60004, 60010, 60020, 60040,
60100, 60200, 60400,
61000, 62000, 64000, 70000, 140000, 100000)
Read Addr
ess for a 0 word.
Complement Address contents.
Read Address for a non-zero
word.

This is a very quick check of the address bit uniqueness.

6.2
.2.9 Pattern 10 Byte Addressing Test -

With ECC Disabled.
Writes all o
nes to a double word.
For each of the 4 Bytes in the Double Word.
Clears one
byte.
Reads all 4 bytes from double word.
Checks for only proper byte cle
ar.
All other bytes set to all ones.

This is only done on one double word address.

6.2.2.10 Pattern 11 Single Bit Error Test -

1. Crea
te a Single Bit Error.

2. Read data Uncorrected (with ECC Disable).

3. Read First Word of data corrected (with ECC Enabled)

4. Check
that the CSR Single Bit Error Flag was set.

5. Clear SBE Flag.

6. Read Second word of data corrected (with ECC Enabled).

7. Check tha
t the CSR Single Bit Error Flag was set.

8. Do (1-7) for a Single Bit E
rror in each of 32 positions of a
double word.
i.e. (32 TI
MES)

9. If not in Quick Verify Mode then Do (1-8) for data consisting
of 1 bit set in each of 32 positions of a double word.
i.e.
(32 X 32 = 1024 Times)

10. Do (1-9) for complemented data (1 Bit clear i
n each of 32 po-
sitions of a double word).
i.e. (1024 X 2
- 2048 Times)
or (32 X 2 = 64 Times (Quick Verify))

11. Clear
any errors out of test locations.

This insures that all Single Bit Errors can
be corrected and detected.

6.2.2.11 Pattern 12 Write Byte Clears SBE Test -

1. Create a Single Bit Error.

2. Write a Byte of Double Word to Ones.

3. Read a Byte of Double Word.

4. If Byte that had SBE then the SBE Flag should be OFF.
If Byte that did not have SBE then SBE Flag should be set.

5. Byte should have been equal to Ones.

6. Do (1-5) for each of the 4 Bytes of the Double Word

7. Do (1-6) for a Single Bit Error in each of 32 positions of a Double Word

i.e. (32 Times)

8. If not in Quick Verify Mode then do (1-7) for data consisting of 1 Bit set in each of 32 positions of a double word.

i.e. (32 X 32 = 1024 Times)

9. Clear any errors out of test locations.

This insures that single bit errors in the data portion (not in check-bits) can be cleared by writing the corresponding byte and that writing any other byte does not change the existing single bit error.

6.2.2.
12 Pattern 13 Create Double Bit Error Test -

1. Create a Double
Bit Error.

2. Access the Data (TST instruction).

3. Check that
the CSR DBE Flags are both set.

4. Initialize CSR to allow parity trap
s on DBE's.

5. Access the Data (TST Instruction).

6. Check tha
t a parity trap occurred.

7. Do (1-6) for the 2nd Bit of each Double Bi
t Error in each of
32 positions of a double word less the one posi
tion of the
1st Bad Bit.
i.e. (31 Times)

8. If not
in Quick Verify Mode then Do (1-7) for the 1st Bit of
each of Doubl
e Bit Error in each of 32 positions of a double
word.
i.e.
(31 X 32 = 992 Times)

9. Do (1-8) for complemented data (Ones versus Ze
ros in Double
Word)
i.e. (992 X 2 = 1984 Times)

or (31 X 2 = 62 Times (Quick Verify))

10. Clear any errors out of test
locations.

This insures that all Double Bit Errors can be created and dete
cted
and cause traps.

NOTE

This test is only run during the first
(QV) PASS when un
der ACT or APT.

6.2.2.13 Pattern 14 Write Inhibit During DATIP With DBE Test -

1. Create a Double Bit Error.

2. Do ASRB on Test Location.

3. Check that Double Word is STILL Bad (Unchanged-with DBE).

4. Do (2-3) on all 4 Bytes of Double Word.

5. Do (1-4) for the 2nd bit of each Double Bit Error in each of 32 positions of a Double Word less the one position of the 1st Bad Bit.
i.e. (31 Times)

6. If not in Quick Verify Mode then Do (1-5) for the 1st Bit of each Double Bit Error in each of 32 positions of a double word.
i.e. (32 X 32 = 922 Times)

7. Do (1-6) for complemented data (Ones versus Zeros in Double Word).
i.e. (922 X 2 = 1984 Times)
or (31 X 2 = 62 Times (Quick Verify))

8. Clear any errors out of test locations.

This insures that the Double Bit Error can be cleared by a DATIP to any affected Byte.

NOTE

This test is only run during the first (QV) pass when under ACT or APT.

6...2.14 Pattern 15 wr
ite Inhibit Of Byte With DBE -

1. Create a Double Bit Error.

2. Do a MOVB immediate to test byte.

3. Check that Double Word is st
ill Bad (unchanged-with DBE).

4. Do (2-3) on all 4 Bytes of Double Word.

5. Do (1-4) for the 2nd Bit of each Double Bit Error in each of

32 positions of a double word less the one position of the
1st
Bad Bit.
i.e. (31 Times)

6. If not in Quick Verify Mode the
n Do (1-5) for the 1st Bit of
each Double Bit Error in each of 32
positions of a Double
Word.
i.e. (31 X 32 = 922 Times)

7. Do (1-6) for Complemented Data (Ones versus Zeros in Double

Word).
i.e. (992 X 2 = 1984 Times)
or (31 X 2 = 62 Times (
Quick Verify))

8. Clear any errors out of test locations.

This insur
es that no Double Bit Error can be cleared by a MOVB to any
affected Byte.

NOTE

This test is only ru
n during the first
(QV) pass when under ACT or APT.

6.
2.2.15 Pattern 16 Write Inhibit Of Word With DBE Test -

1. Create
a Double Bit Error.

2. Do MOV IMMEDIATE on test location.

3. C
heck that Double Word is STILL Bad (unchanged-with DBE).

4. Do (2-3) on
both Double Words.

5. Do (1-4) for the 2nd Bit of each Double Bit Erro
r in each of
32 positions of a Double Word less the one position o
f the
1st Bad Bit.
i.e. (31 Times)

6. If not in Qu
ick Verify Mode then Do (1-5) for the 1st Bit of
each Double Bit E
rror in each of 32 positions of a Double
Word.
i.e. (32 X
32 = 992 Times)

7. Do (1-6) for Complemented Data (Ones versus Zeros i
n Double
Word).
i.e. (992 X 2 - 1984 Times)
or (
31 X 2 = 62 Times (Quick Verify))

8. Clear any errors out of test locat
ions.

This insures that no Double Bit Error can be cleared by a MOV to any

affected word.

NOTE

Thi
s test is only run during the first
(QV) pass when under ACT o
r APT.

6.2.2.16 Pattern 17 Holding 1's & 0's Test -

SEQ 0107

1. Write a 16K Bank with alternating Bytes of Zeros & Ones writing a Byte at a time.

2. Read each Word for correct pattern.

3. Do (1-2) again for a complement pattern.

This checks the memory for the capability of holding 0's & 1's.

6.2.2.17 Pattern 20 Marching 0's & 1's In Check Bi
ts Test -

1. Write Double Words of 000000,,100000 which causes check
bits
to equal 100 while addressing increments.
(Write Up/1
00 --> check bits)

2. If in Quick Verify Mode then Go to Step (5).

3. REad Double Words & check while writing Zeros and addressing

decrements.
(Down / 100 --> 077)
This flips all the checkbit
s.

4. Read Double Words & check while writing 000000,,100000 while

addressing increments.
(Up / 077 --> 100)

5. Read Doub
le Words & check while writing Zeros & addressing
increments.

(Up / 100 --> 077)

6. Read Double Words & check while writing 0000
00,,100000 while
addressing decrements.
(Down / 077 --> 100
)

7. Read Double Words & check while Addressing increments.
(
Up / 100)

This checks the integrity of the MOS chips that store the checkbits
.

6.2.2.18 Pattern 21 Marching 0's & 1's Test -

1. Write a B
ackground of alternating Bytes of Zeros & Ones

2. For the 16K Bank addr
essing Down
(a) Read check a word
(b) Byte Swap a word

(c) Read check a word

3. For the 16K Bank addressing Up

(a) Read check a word
(b) Byte Swap a word
(c) Read check a
word

4. For the 16K Bank addressing Up
(a) Read check a word

(b) Byte Swap a word
(c) Read check a word

5. For t
he 16K Bank addressing Down
(a) Read check a word
(b) Byte S
wap a word
(c) Read check a word

This checks the integrity of the 3
2 Bit Double Words.

It executes out of the User Data PAR's.

NOTE

It is not uncommon to see a misl
eading
error typeout because the second test in

each case is based upon a byteswap of
the first test which ma
y or may not have
failed. If the error report indicates

errors in pairs with the bad bit in the
second repor
t being the same bit posi-

hould tion relative to a byte then you s

SEQ 0110

ignore the second error report.

6.2.2.19 Pattern 22
Refresh Test -

1. Write a diagonal pattern of ones on every KDIA
G(TH) stripe &
write zeros elsewhere.

This pattern is on
addresses not bit positions.

Example:

Address MSB's

		0 0 0 1 0 0 0 1
	LSB's	0 0
1 0 0 0 1 0		
		0 1 0 0 0 1 0 0
		1 0 0 0 1 0 0 0
	0 0 0 1 0 0 0 1	
		0 0 1 0 0 0 1 0
		0 1 0 0 0 1 0
0		
		1 0 0 0 1 0 0 0

NOTE

Example uses KDIAG of value 4 more typical is a valu
e
of 8. Consult the symbolic definition of "KDIAG" in
the program listing to be sure.

2. Disturb each row for > 3.2ms

3. Read check diagonal pattern

4. Do (1-3) KDIAG times moving
the placement of the diagonal
stripe to cover all address positio
ns.

5. Do (1-4) for a complement pattern
(zeros in a backgro
und of ones)

NOTE

This test is not normally executed except under APT or ACT. It may be invoked via Field Service Command 13 (Kamikaze Mode).

6.2.2.20 Pattern 23 Shifting Diagonal Pattern Test -

Similar in overall operation to pattern 22 except it does not delay for refresh and disturb rows.

NOTE

This test is not normally executed except under APT or ACT. It may be invoked VIA Field Service Command 13 (Kamikaze Mode).

6.2.2.21 Pattern 24 Fast Galloping Pattern Test -

This does a classical galloping pattern except that addressing is incremented by 400 Octal (every 64th double word)

NOTE

This test is not normally executed except under APT or ACT. It may be invoked VIA Field Service Command 13 (Kamikaze Mode).

6.2
.2.22 Pattern 25 Interrupt Enable Test -

1. Set CSR to Allow DBE T
raps.

2. Access Test Double Words.

3. Check for no Double Bit
Error Trap.

4. Enable CSR for SBE Traps.

5. Access Test Double
Words.

6. Check for no SBE Trap.

7. Write a SBE in 1 Byte.

8. Disable CSR for Parity Traps.

9. Access Test Double Words.

10. Check for no Traps.

11. Enable CSR for SBE Traps.

12.
Access Test Double Words.

13. Check to Insure Trap Occurred.

14.
do (7-13) for the 3 other Bytes in the Double Word.

15. Create a DBE in
1 Byte.

16. Disable CSR for Parity Traps.

17. Access the Test D
ouble Word.

18. Check for no Traps.

19. Enable CSR for DBE Traps
.

20. Access the Test Double Word.

21. Check to Insure Trap Occu

rred.

22. Enable CSR for SBE Traps.

23. Access the Test Double W
ord.

24. Check to Insure Trap Occurred.

25. Do (15-24) for the 3
other Bytes in the Double Word.

This insures that SBE's & DBE's give the cor
rect type of traps.

6.2.2.23 Pattern 26 Random Data Test -

Write Rando
m Data in a 16K Bank while incrementing the Addresses.

Read check Random Data
.

This routine regenerates the same random numbers by using the same
see
d as the write sequence. After the read check the seed is updated
so that the
next use of this pattern will not invoke the same sequence
of random numbers.

If you wish to change the random sequence so that it is different than
any o
ther run in the same configuration then there are 2 ways of doing
so.

1
. Modify symbolic locations "SEEDHI" and "SEEDLO" to any number
,ou l
ike.

2. Enter Field Service Mode and execute this pattern (command 5)
on some (any good) bank for a short time (30 sec or so).

This execut
es out of the User Data PAR's, the Kernel Data PAR's, and
the Supervisor Data
PAR's.

6.2.2.24 Pattern 27 Unique Bank Test -

This pattern use
s Pattern 0 to write & read the Bank number in each
bank.

It does not tes
t Banks that require relocation to test.

It does not run as part of any scrip
t but rather is always run after
normal pattern tests are complete.

6.2.2.25 Pattern 30 Flush Out DBE's Test -

This Reads each location then
 moves the old value back in. This is
done with ECC Disabled and therefor
e corrects any DBE's or SBE's (if
possible).

It does not run as part of any
script but rather is always run just
prior to the End of Pass Code, as pa
rt of a Control 'C' (Boot) com-
mand, as part of End of Pass shutdown for ACT o
r XXDP Chain Mode, as
part of hanging sequence after an error if under ACT
 or APT, and as
part of a shutdown sequence directed by Switch 8 (Halt Program)
.

6.2.2.26 Pattern 3' SOB-A-LONG Test -

Rationalization

In order to concentrate the memory cycles of a test into a particular address, we must cut the overhead cycles to a minimum. Frequently, the inst
ruction itself may provide adequate data or set up a back-
ground in which
any complemented bit may find it hard to survive.

The SOB instruction is the
only PDP-11 instruction that is (1) a sin-
gle operand, (2) can be repeated
ly executed at the same PC and, (3)
can escape this repetitious loop.

Hence,
I believe it is possible to SOB a MOS cell to death (or at
least brain
wash him), and to SOB a core into over-heating (or at
least warm discomfort)
.

The SOB Routine will be loaded and called with R0 set equal to the SOB
con
stant "SOBK", R1 set equal to the complement of a "SOB R0,." In-
struction "
100776".

Simplified SOB Example:

```
1$:     SOB     R0,1$   ;SOB till R0 underflows
        M
OV      R1,1$   ;Write complement of SOB
        CMP     R1,1$   ;Read  check not SOB
        BEQ        2$   ;
Skip if OK
        SOBFAIL         ;Trap  report error
2$:     SOBMOV1         ;Code to get self moved

        SOBMOV2         ;Forward 1 word and run again
        SOBMOV3
        SOBMOV4
        SOBMOV...
```

The
value of the SOB constant can be found at symbolic location "SOBK"
(typical 25
decimal).

This test is not in the normal script of execution but may be ad
ded

via the APT E-TABLE, reference symbolic locations 'MKPAT', 'MJPAT', 'SD
DW2-5". Field Service Mode command 8 is the normal method of run-
ning this p
attern.

SEQ 0119

NOTE

This test i
s not normally executed ex-
cept under APT or ACT. It may
be in-
voked VIA Field Service Command 13 (Ka-
mikaze Mode).

6.2.2.27 Pattern 32 Skewed Up Address Test -

Referen
ce the Multiport section

6.2.2.28 Pattern 33 Write Recovery Test -

This test causes a WRITE, READ, WRITE, READ, ... to occur in memory
and
if the 1st, 3rd, 5th, ...READ is bad the program may bomb or if
the 2nd, 4th
, 6th, ... READ is bad the program will gracefully type
out the error.

W
RITE RECOVERY TEST
THIS TEST DIFFERS FROM OTHER TESTS IN THAT IT CONSISTS
OF
A SMALL TEST PROGRAM ACTUALLY RUNNING IN THE BANK UNDER TEST.
THE PROGRAM
IS SELF MODIFYING AND MAY BE DIFFICULT TO DEBUG.
TO AID IN THE DEBUG, REMEMBER
THAT THE BANK AND MARGIN ARE BEING
DISPLAYED. THIS WILL ALLOW THE USER TO AT
LEAST SEE WHICH MEMORY
BANK FAILED.
THE TEST CONSISTS OF 1/2 OF THE BANK
STORED WITH "MOV R2,-(PC)"
AND THE OTHER 1/2 CONTAINING "177667". "177667" IS
THE COMPLEMENT
OF "JMP (R0)" INSTRUCTION. R2 CONTAINS "COM -(R1)" INSTRUCTION

ON ENTRY TO THE BANK AND R1 CONTAINS THE HIGHEST TEST ADDRESS IN
THAT BANK.

IF YOU UNDERSTAND THIS SO FAR THE REST IS EASY.
THE TEST EXECUTION IS A
S FOLLOWS:
1. THE "MOV R2,-(PC)" INSTRUCTION EXECUTES STORING
THE CONTEN
TS OF R2 IN THE ADDRESS IT VACATED (DUE TO -(PC).
2. SINCE R2 CONTAINS A "COM
-(R1)" INSTRUCTION IT COMPLEMENTS
THE HIGHEST ADDRESS UNDER TEST. THIS ADD
RESS CONTAINED
"177667" SO AFTER THE COM -(R1) IT EQUALS 110
CLEVERLY
THIS IS THE "JMP (R0)" INSTRUCTION.
3. THIS SEQUENCE CONTINUES UNTIL THE "MOV
R2,-(PC)"

INSTRUCTIONS REACH THE MIDDLE OF THE TEST BANK.
THEN THE "J
MP (R0)" INSTRUCTION IS MET
AND EXECUTED. R0 CONTAINED THE RETURN ADDRESS B
ACK
TO TEST 13.
4. THESE STEPS ARE REPEATED FOR EACH BANK UNDER TEST.

SEQ 0121

NOTE

This test is not n
ormally executed ex-
cept under APT or ACT. It may be in-
voked VIA Field Service Command 13 (Ka-
mikaze
Mode).

6.2.2.29 Pattern 34 Branch Gobble Test -

This test loads a small routine into the memory under test. The routine moves itself along in memory one word after each pass so that when it reaches the end every instruction has executed from every location with the exception of the beginning and end of each test area.

The Branch Gobble's general format after you eliminate setup code and code to move the program along is as follows.

```
BGTES
T:      0                       ;TEST WORD
BRGOBB: SEC
        ADCB    BGTEST          ;INC LOW BYTE
        BMI     1$              ;END LOOP
AFTER 128 TIMES
        INCB    BGTEST+1        ;INC HIGH BYTE
        BR      BRGOBB          ;LOOP 128 TIMES
1$:
        BVS     2$              ;BRANCH IF V-BIT SET (SHOULD BE)
        ERROR                   ;ERROR TRAP
2$:     CLV                     ;CLEA
R V-BIT
        INCB    BGTEST          ;INC HIGH BYTE ONE LAST TIME
        BCS     3$              ;BRANCH IF C-BIT S
ET (SHOULD NOT BE)
        BVC     3$              ;BRANCH IF V-BIT CLEAR (SHOULD NOT BE)
        BMI     4$              ;B
RANCH IF N-BIT SET (SHOULD BE)
3$:     ERROR                   ;ERROR TRAP
4$:     RETURN
```

This code origionally came from the PDP-11 Family Instruction Exerciser DZQKA-A. The first MOS memorys fell succeptable to this section of that diagnostic and it has been an important memory exerciser ever since.

NOTE

This test is not normally executed except under APT or ACT. It may be invoked

VIA Field Service (Command 13 (Kamikaze Mode).

SEO 0123

6.2.2.30
Pattern 35 Soft Error Test -

Rationalization

MOS chi
ps have a failure mode in which they can randomly pick or drop
bits. This is
caused by Alpha particles bombarding the cell. If the
cell is very small (and
they are) then the electrons displaced by the
Alpha particle are sufficient
to cause the cell to change from a one
to a zero or from a zero to a one.

T
his test is controlled by the main program so that it is used to cre-
ate a pa
ttern of 125252 and 52525 on alternate passes of the program.
The configuration
table is used to flag banks that have the pattern
invalidated because anoth
er pattern was written over this background.

This pattern is nothing more tha
n a clever use of pattern 0.

6.2.2.31 Pattern 999 Null Test -

This
is an instant return added to preserve the software structure.

This pattern
replaces any real patterns when the APT E-Table does not
specify a pattern to
be run.

77

7.0 Program Features

7.1 Fast Data Access Rates

One of t
he main areas of concern in testing memory in systems environ-
ments is speed
. It is my belief that one of the prime reasons that
system programs like RSI
S,IAS and RUMPS can crash due to memory fa'-
lures not detectable by memor
y diagnostics (0-124K,0-2 MEG,etc.) is
because of multiple NPR devices contendi
ng for the bus. After some
delay a NPR device becomes bus master with his s
ilo backed up (perhaps
only 3-8 words) and does several memory transfers at
memory data
rates.

On the other hand most diagnostics when writing readin
g and/or check-
ing patterns spend most of their time fetching instructions a
nd oper-
ands out of their program space and proportionally little time access-

ing the memory under test.

I have attempted to optimize this diagnostic's e
rror detecting abili-
ties around the primary design criteria of speed. To t
his end I have
taken the following steps.

7.1.1 Fast City -

Utili
zation of Memory Management Registers as Non Memory Bus, Non UN-
IBUS, Bipolar
Memory. Since user mode is only used for relocation and
data space is never u
sed then subroutines can be executed from the
UIPAR's, UDPAR's, KDPAR's, S
DPAR's and with some Bit Pattern restric-
tions the UIPDR's, UDPDR's, KDPDR's,
and SDPDR's.

The program runs in Kernel mode and Patterns are executed in Su

pervi-
sor mode for mapping purposes. All core patterns and some MOS Patterns are subroutines that are moved to this Bipolar region referred to in th
e program as Fast City.

SEQ 0126

7.1.2 SOB's -

Utilization of the PDP-11/70 Instru
ction Set to speed pattern algor-
ithms (principally the SOB). No attempt
is made to support anything
ess than a PDP-11/70.

7.1.3 CACHE -

CACHE is used between pattern tests to decrease program pass times.
CACHE ca
n be defeated or partially disabled by the operator (reference
section 2.3.3.1)
.

7.2 Bank Zero Testing

Bank Zero has been traditionally neglected by
memory diagnostics for
the following reason.

The vector space exists ther
e and ALL traps must not access test pat-
tern data. If the area is test
ed the diagnostic must not use any
traps and it is against the rules for power
to fail.

Systems with memory management can overcome this because all traps a
re
to Kernel Virtual space even power fail (caution must be observed be-
caus
e power up goes to physical address 24 (because the Memory Manage-
ment Unit co
mes up off)).

However, Catch 22 is that the diagnostic is not APT compatible
in this
mode because APT Accesses Physical Memory Locations.

PDP-11/70 Syste
ms can over come this because the UNIBUS MAP can fool
APT.

Because of the
previous arguments this program does not relocate in
the true since of t
he word (i.e. no position independent code was

written (at least not on purpos
e)), but rather this program moves and
remaps (hereafter referred to as rel
ocates). This enables the com-
plete testing of Bank Zero or any other program
space or privileged
space exactly as all other banks are tested. (The cond
itional test to
see if a bank is protected is complemented when relocated).

7
.3 Differences In Core Testing With 0-2 MEG (DEMJA)

7.3.1 Delta Noise
Test Only Performed With 3 XOR 9 Test -

Reason: DEMJA performed the delta noise test with constant data however, it will only have an adverse effect if performed with a worst-case pattern.

7.3.2 8 XOR 13 Test D
eleted -

Reason: Designed for a PDP11-20 Memory not presently in use.

7.3.3 3 XOR 9 Rewritten -

Reason: was actually a 4 XOR 9 and should ha
ve been a 4 XOR 10 for
PDP-11/70's to account for reading Double Words.

?.
4 Memory Configuration Map

This map is printed out immediately after sizing
the memory if SW6 is
set (reference section 2.3.1). It can also be printed
at any later
time in Field Service Mode (reference section 2,3,4,3,7)

Examp
le:

```
                        MEMORY CONFIGURATION MAP

    16K BANKS
                1       2       3       4       5       6       7
        01234567012345670123456701234567012345670123456
7012345670123
ERRORS                      XX
CPU MAP 11111111111111111111111111111
1110000000000000000000000000000
INTRLV  22222222222222222222222222222222???????
????????????????????
MEMTYPE KKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKKK00000000000000000
000000000000
BOX     00000000000000000000000000000000??????????????????????????????
?
PROTECT P P
            0       1       2       3       4       5       6
        45670123456701234567012345670123456701234567
ERRORS
ACCESSED0000000000000000000000
000000000000000000000000000000000000000000
INTRLV  ??????????????????????????????????
????????????????????????????
MEMTYPE 000000000000000000000000000000000000000000000000
0000000000000000
BOX     ????????????????????????????????????????????????????????????
????????
PROTECT
```

Displayed are Banks 0-167 Octal (2 meg words). If the
Fat Terminal
Switch was set (reference section 2.3.1) then all Banks would
fit on
one line.

The sizing routine could not write zeros and ones in Bank
s 20 & 21
hence they are marked as bad with X's.

The only CPU was able to
access banks 0-37 (512 K words). If more
CPU's were present this would be

a Hexadecimal number indicating which
CPU's (SLAVE3,SLAVE2,SLAVE1,MASTER) coul
d access each bank.

SEQ 0131

The interleaving on Banks 0-37 is 2 way. This may be ext
ernal with no
internal or internal with no external - however since there is
only
one box of MOS (BOX 0) it must be internal interleave.

Banks 0-37 are
Memory Type K (MK11) and Banks 40-167 do not exist.
Memory Type J would ind
icate MJ11 memory.

Banks 0-37 are located in box 0. Boxes are assigned to CS
R locations
in order and MJ11 Boxes will never have a Box number only a ques
tion
mark.

Banks 0 and 2 are protected because they are program space. Ba
nk 0
and 2 are also protected because they are in the bottom 16K of an MK11
c
ontroller. The protection is hierarchical and program space oversha-
dows MK11
protection. Banks 0 and 2 will not be tested until the pro-
gram relocates.
If any bank is protected by MK11 and not because it
is in program space it wi
ll have a "K" typed in this row.

7.5 Everything You've Always Wanted To Know
About SUPERMAC ...

SUPER-MAC is a set of structured programming macros that
allows pro-
grams to be written in a high level, easily understood language.

As a general rule, most SUPER-MAC statements can be single-line state-
ments
or multiple-line (nested) block statements. A single-line
statement must
be completed on one source line; no continuation lines
are allowed. Single-
line statements should be as short and simple as
possible. Comments may also b
e included on a source line. All the
general rules, conditions, etc., t
hat govern MACRO-11 also govern
SUPER-MAC. Spacing on a source lne is very im
portant. The elements
should be separated by a comma or a space. Tabs shou
ld never be used
for spacing. For example: The expression A+B is interpreted
differ-
ent than A + B.

All the conditional statements can be written as mu
ltiple-line nested
blocks. Each level of nesting within a block must be term
inated with
an associated END statement. Each level of nesting should be inden
ted
two spaces.

User written macros or assembly language instructions may be
included
in a program if desired. As a debugging aid, if the symbol LST$$
is
defined, it will cause generated code and labels to be listed. All
prog
rams must begin with the macro call SMACIT. This call initializes
SUPER-MAC.
All legal PDP-11 source and destination operands are legal
in SUPER-MAC.

```
7.5.
1  Sample Source File -
        .ENABL ABS
        .ENABL AMA
        .MCALL .SUPER
        .SUPER
        ;L
ST$$-0
        BITS=40
A:      0
B:      0
C:      0
D:      0
E:      0
F:      0
G:      0
H:      0
I:      0
J:      0
;L
ET EXAMPLES
        LET R0 :- A
        LET B :- C + D
        LET E := F +  #1
        LET G := H +  #2

        LET J := J +  #01
        LET A :B  B
;IF EXAMPLES
        IF A IS TRUE
          MOV    #23,D
        END ;OF IF A
        IF B IS FALSE
          MOV    #34,E
        END ;OF IF B
        IF A EQ B THEN LET
 C :- D
        IF A LT B
          MOV   C,D
        ELSE
          MOV   E,D
        END ;OF IF A
        IF A EQ B AN
D  NE D
          MOV   F,G
        END ;OF IF A
        IF A EQ B OR C NE D
          MOV   F,G
        END ;OF
IF A
        IFB A EQ B AND C EQ  #1
          MOV   H,J
        ELSE
          MOV   E,
```

```
        END ;OF IFB A

IFB A EQ B ANDB C EQ  #1
          MOV   H,-
        ELSE
          MOV   E,J
        END ;OF IFB A
        IF RES
ULT IS EQ
          MOV   A,B
        END ;OF IF RESULT
        IF  #BIT5 SET.IN A
          MOV   B,C
        END
 ;OF IF  #BIT5
```

```
        IF  #BITS OFF.IN A
          MOV   C,D
        END ;OF IF  #BITS
;ON.ERROR
IS LIKE AN IF STATEMENT ON THE C-BIT
;ON.ERROR EXAMPLES
        ON.ERROR
          MOV   A,B

        ELSE
          MOV   C,B
        END ;OF ON.ERROR
        ON.NOERROR
          MOV   C,B
        ELSE
          MOV   A,
B
        END ;OF ON.NOERROR
        ON.ERROR THEN LET A :B  B
;FOR EXAMPLES
        FOR I :-  #-
5 TO  #23
          INC   A
        END ;OF FOR I
        FOR R0 .-  #0 TO  #140 BY  #4
          DEC   A(R0
,
        END ;OF FOR R0
        FOR I :   #133 DOWNTO  #3 BY  #2
          ADD   A,B
        END ;OF FOR
I
;BEGIN EXAMPLES
        BEGIN ALPHA
          FOR R0 :   #0 TO  #167
            MOVB        A(R0),B
            IF B LT #0 THEN LEAVE ALPHA
          END ;OF FOR R0
          FOR R0 :-  #400 TO  #567

            IF B GE #0 THEN LEAVE ALPHA
          END ;OF FOR R0
        END ALPHA
;$RETURN EXAM
PLES
        $RETURN
        $RETURN ERROR
        $RETURN NOERROR
;CASE EXAMPLES
        MOV     A,RC
        CA
SE R0
          A
          B
```

```
C
D
E
F
END ;OF CASE RO
.END
```

```
7.5.2  S
ample Listing File (with no expanded macros) -  -
        1 000000                                .ENABL AB
S
        2                                       .ENABL AMA
        3                                       .MCALL .SUPER
        4 000000                                .SUPE
R
        5                                       ;LST$$=0
        6           000040                      BIT5=40
        7 000000    000000
A:      0
        8 000002    000000              B:      0
        9 000004    000000              C:      0
       10 0000
06      000000                          D:      0
       11 000010    000000              E:      0
       12 0000'2    000000              F:      0

       13 000014    000000              G:      0
       14 000016    000000              H:      0
       15 000020    00
0000                            I:      0
       16 000022    000000              J:      0
       18                               ;LET EXAMPLES
       19
000024                                  LET R0 :- A
       20 000030                                LET B := C + D
       21 000044                                LE
T E := F + #1
       22 000056                                LET G :- H + #2
       23 000072                                LET J :
 J + #01
       24 000100                                LET A :B- B
       25                               ;IF EXAMPLES
       26 000
106                                     IF A IS TRUE
       27 000114    012737  000023  000006          MOV    #23,D

 28    000122                                   END ;OF IF A
       29 000122                                IF B IS FALSE
       30 000130    01
2737    000034    000010                MOV    #34,E
       31 000136                                END ;OF IF B
       32 00
0136                                    IF A EQ B THEN LET C :- D
       33 000154                                IF A LT B
       34 000164
       013737    000004  000006            MOV   C,D
       35 000172                                ELSF
       36 000174    013
737     000010    000006                MOV   E,D
       37 000202                                END ;OF IF A
       38 000202
```

```
                                                    IF A EQ B AND C NE D
     39 000222  013737  000012  000014                    MOV   F,G

   40   000230                                          END ;OF IF A
     41 000230                                          IF A EQ B OR C NE D
     42 0
00250    013737  000012  000014              MOV   F,G
     43 000256                                          END ;OF IF A

44        000256                                        IFB A EQ B AND C EQ  #1
     45 000276  013737  000016  000022
MOV      H,J
     46 000304                                          ELSE
     47 000306  013737  000010  000022                    MOV
        E,J
     48 000314                                          END ;OF IFB A
     49 000314                                          IFB A EQ B ANDB C EQ
#1
     50 000334  013737  000016  000022                    MOV   H,J
     51 000342                                          ELSE

     52 000344  013737  000010  000022                    MOV   E,J
     53 000352                                          END ;OF I
FB A
     54 000352                                          IF RESULT IS EQ
     55 000354  013737  000000  000002
                  MOV   A,B
     56 000362                                          END ;OF IF RESULT
     57 000362                                          IF  #BIT5
SET.IN A
     58 000372  013737  000002  000004                    MOV   B,C
     59 000400
END ;OF IF  #BIT5
```

```
     60 000400                                          IF  #BIT5 OFF.IN A
     61 000410  013737
        000004  000006              MOV   C,D
     62 000416                                          END ;OF IF  #BIT5
     63
;ON.ERROR IS LIKE AN IF STATEMENT ON THE C-BIT
     64                                                 ;ON.ERROR EXAMPLES
     65 000416                                          ON.ERROR
     66 000420  013737  000000  000002                    MOV   A,B
     67 000426                                          ELSE
     68 000430  013737  000004  000002                    MOV   C,B

 69      000436                                         END ;OF ON.ERROR
     70 000436                                          ON.NOERROR
     71 000440  0
13737    000004  000002              MOV   C,B
     72 000446                                          ELSE
     73 000450  01373
/       000000  000002              MOV   A,B
     74 000456                                          END ;OF ON.NOERROR
     75 00
0456                                                    ON.ERROR THEN LET A :B  B
     76                                                 ;FOR EXAMPLES
     77 000466
                FOR I :-  #-5 TO  #23
     78 000474  005237  000000                            INC   A
     79 00050
0                                                       END ;OF FOR I
     80 000514                                          FOR R0 :=  #0 TO  #140 BY  #4
     81 0
00516    005360  000000                                   DEC   A(R0)
     82 000522                                          END ;OF FOR R0
     83
000534                                                  FOR I :   #133 DOWNTO  #3 BY  #2
     84 000542  063737  000000  0000
02                    ADD   A,B
     85 000550                                          END ;OF FOR I
     86                                                 ;BEGIN EXAMPLES

    87  000566                                         BEGIN ALPHA
     88 000566                                          FOR R0 :=  #0 TO  #167

 89      000570  116037  000000  000002                    MOVB        A(R0),B
     90 000576                                          IF
B LT #0 THEN LEAVE ALPHA
     91 000604                                          END ;OF FOR R0
     92 000614
                  FOR R0 :   #400 TO  #567
     93 000620                                          IF B GE #0 THEN LEAVE ALPHA

     94 000626                                          END ;OF FOR R0
     95 000636                                         END ALPHA
     96
        ;$RETURN EXAMPLES
```

```
     97 000636                          $RETURN
     98 000640                          $RETURN ERROR                                SEQ 0140

     99 000644                          $RETURN NOERROR
    100                             ;CASE EXAMPLES
    101 000650
         013700  000000             MOV     A,R0
    102 000654                              CASE R0
    103 000664  000000
                        A
    104 000666  000002                        B
    105 000670  000004                        C
    106 00
0672        000006                      D
    107 000674  000010                        E
    108 000676  000012
F
    109 000700                              END ;OF CASE R0
    110
    111         000001                      .END
```

```
V5.3
  Sample Listing File (with expanded macros) -  -
      1 000000                                  .ENABL AB
S
      2                                         .ENABL AMA
      3                                         .MCALL .SUPER
      4 000000                                  .SUPE
R
      5          000000                         LST$$=0
      6          000040                         BIT5=40
      7 000000   0000
00                          A:      0
      8 000002   000000               B:       0
      9 000004   000000               C:       0
     1
0          000006   000000               D:       0
     11 000010   000000               E:       0
     12 000012   000000
                 F:      0
     13 000014   000000               G:       0
     14 000016   000000               H:       0
     15 000
020          000000                    I:       0
     16 000022   000000               J:       0
     18                               ;LET EXAMPLES

   19   000024                                  LET R0 :- A
        000024   013700  000000                                                  MOV A,R0
     20
        000030                                  LET B := C + D
        000030   013737  000004  000002                                         MOV C,B
        00
0036    063737   000006  000002                                          ADD D,B
     21 000044                                  LET E := F +  #
1
        000044   013737  000012  000010                                         MOV F,E
        000052   005237  000010
                                 INC E
     22 000056                                  LET G := H +  #2
        000056   013737  000016  000014
                                                              MOV H,G
        000064   062737  000002  000014                                         ADD #2,G
     23 0000
72                               LET J :- J +  #01
        000072   062737  000001  000022                                         ADD #01,J

  24    000100                                  LET A :B= B
        000100   113737  000002  000000                                         MOVB B,A

    25                           .IF EXAMPLES
     26 000106                                  IF A IS TRUE
        000106   005737  000000
                                                          TST A
        000112   001403                                                         BEQ L0
```

```
3      27 000114  012737  00002
          000006           MOV    #23,D
       28 000122                                 END ;OF IF A
          000122                                                                 L0:
;;;;;;
       29 000122                                 IF B IS FALSE
          000122  005737  000002                                                       TST B
          000126  001003                                                               BNE L1
       30 000130  012737  000034  000010           MO
V          #34,E
       31 000136                                 END ;OF IF B
          000136                                                                 L1:;;;;;;
       32
000136                                IF A EQ B THEN LET C := D
          000136  023737  00000C  000002                                               CM
P A,B
          000144  001003                                                               BNE L2
          000146  013737  000006  000004
          MOV D,C
          000154                                                                 L2:;;;;;;
       33 000154                                 IF A LT B
          000154  023
737       000000  000002                                                     CMP A,B
          000162  002004                                                               BGE L3
       34
000164    013737  000004  000006            MOV  C,D
       35 000172                                 ELSE
          000172  0004
03                                                                           BR L4
          000174                                                                 L3:;;;;;;
       36 000174  013737  000010
          000006           MOV    E,D
```

```
     37 000202                                          END ;OF IF A
        000202                                                                  L4:::::
;:
     38 000202                                          IF A EQ B AND C NE D
        000202  023737  000000  000002
                                          CMP A,B
        000210  001007                                                          BNE L5
        000212  023737  000004  000006
                                                  CMP C,D
        000220  001403                                                          BEQ L5
     39 000222  013737  000012
        000014             MOV   F,G
     40 000230                                          END ;OF IF A
        000230                                                                  L5:::::
;:
     41 000230                                          IF A EQ B OR C NE D
        000230  023737  000000  000002
                                  CMP A,B
        000236  001404                                                          BEQ L6
        000240  023737  000004  000006
                                        CMP C,D
        000246  001403                                                          BEQ L7
        000250                                                                  L6:::::::
     42 000250  013737  000012  000014            MOV   F,G
     43 000256                                          END ;OF IF
A
        000256                                                                  L7:::::::
     44 000256                                          IFB A EQ B AND C EQ  #1
        000
256     123737  000000  000002                                                 CMPB A,B
        000264  001010                                                          BNE L10
        000266  023727  000004  000001                                         CMP C,#1
        000274  001004                                                          BNE
L10
     45 000276  013737  000016  000022            MOV   H,J
     46 000304                                          ELSE
        000304  000403                                                          BR L11
        000306                                                                  L10:::::::
     47 000306
        013737  000010  000022            MOV   E,J
     48 000314                                          END ;OF IFB A
        000314
                                                                        L11:::::::
     49 000314                                          IFB A EQ B ANDB C EQ  #1
        000314  123737                                                                  CMPB A,B
        000000  000002                                                                  BNE L12
        000322  001010
        000324  1                                                                       CMPB C,#1
23727   000004  000001                                                                  BNE L12
        000332  001004
```

```
  50     000334  013737  000016  000022          MOV   H,J                                                    SEQ 0144
    51 000342                                   ELSE
       000342
       000403                                                          BR L13
       000344                                                          L12:::::::
    52 000344  013737
000010  000022            MOV   E,J
    53 000352                                   END ;OF IFB A
       000352
L13:::::::
    54 000352                                   IF RESULT IS EQ
       000352  001003                                                      BNE L1
4
    55 000354  013737  000000  000002          MOV   A,B
    56 000362                                   END ;OF
 IF RESULT
       000362                                                          L14:::::::
    57 000362                                   IF  #BIT5 SET.IN A

       000362  032737  000040  000000                                       BIT #BIT5,A
       000370  001403
BEQ L15
    58 000372  013737  000002  000004          MOV   B,C
    59 000400                                   E
ND ;OF IF  #BIT5
       000400                                                          L15:::::::
    60 000400                                   IF  #BIT5 OFF
.IN A
       000400  032737  000040  000000                                       BIT #BIT5,A
       000406  001003
                                                BNE L16
    61 000410  013737  000004  000006          MOV   C,D
    62 000416
                                    END ;OF IF  #BIT5
```

```
      000416
   63
LIKE AN IF STATEMENT ON THE C-BIT
   64
   65 00041
6
      000416  103004
   66 000420  013737  000000
      000002               MOV   A,B
   67 000426
      000426  000403
      000430
   68 000430  013737  000004  000002
   69 000436
      000436
   70 000
436
      000436  103404
   71 000440  013737  00
0004  000002               MOV   C,B
   72 000446
      000446  000403
L22
      000450
   73 000450  013737  000000  000002
      A,B
   74 000456
      000456
75    000456
      000456  103003
      000
460   113737  000002  000000
      000466
 76
   77 000466
      000466  012737
      177773  000020
      000474
   78 000474
005237 000000                    INC   A
   79 000500
      000500  005237  000
020
      000504  023727  000020  000023
      000512
003770
      000514
   80 000514
0 :   #0 TO  #140 BY  #4
      000514  005000
```

```
;ON.ERROR IS
;ON.ERROR EXAMPLES
ON.ERROR
        ELSE
          MOV   C,B
        END ;OF ON.ERROR
ON.NOERROR
        ELSE
          MOV
        END ;OF ON.NOERROR
        ON.ERROR THEN LET A :B= B
;FOR EXAMPLES
        FOR I :=  #-5 TO  #23
        END ;OF FOR I
        FOR R
```

```
L16:::::::
        BCC L17
        BR L20
L17:::::::
L20:::::::
        BCS L21
        BR
L21:::::::
L22:::::::
        BCC L23
MOVB B,A
L23:::::::
MOV #-5,I
        B0:::::::
INC I
        CMP I,#23
BLE B0
        E0:::::::
        CLR R0
```

```
         000516                                                                        B1
:;;;;;;
      81 000516  005360  000000                    DEC    A(R0)
      82 000522                                   END ;0
F FOR R0
         000522  062700  000004                                                              ADD #4,R0
         000526  020027  000140
                                                        CMP R0,#140
         000532  003771                                                                      BLE B1
         000534                                                                        E1:;;;;;;
.;
      83 000534                                   FOR I :   #133 DOWNTO  #3 BY  #2
         000534  012737  000133
         000020                                                          MOV #133,I
         000542                                                                        B2:;;;;;;
      84 000542  063737
         000000  000002            ADD    A,B
      85 000550                                   END ;OF FOR I
         000550  162737  0
00002    000020                                                          SUB #2,I
         000556  023727  000020  000003                                                      CMP I,#
3
         000564  002366                                                                      BGE B2
         000566                                                                        E2:;;;;;;;;
      86                           ;
BEGIN EXAMPLES
      87 000566                                   BEGIN ALPHA
         000566                                                                        B3:;;;;;;
  88     000566                                     FOR R0 :=  #0 TO  #167
         000566  005000                                                                      CLR R0
         000
570                                                                              B4:;;;;;;
```

```
     89 000570  116037  000000  000002              MOVB        A(R0)
,B
     90 000576                                      IF B LT #0 THEN LEAVE ALPHA
        000576  005737  000002                                  TST B
        000602  002415                                          BLT E3
     91 000604                                    END ;OF F
OR R0
        000604  005200                                          INC R0
        000606  020027  000167                                  CMP R0
,#167
        000612  003766                                          BLE B4
        000614                                              E4:::::::
     92 0
00614
                                          FOR R0 :   #400 TO  #567
        000614  012700  000400                                  MOV #400,
R0
        000620                                              B5:::::::
     93 000620                                      IF B GE #0 THEN LEAVE AL
PHA
        000620  005737  000002                                  TST B
        000624  002004                                          BGE E3

     94 000626                                    END ;OF FOR R0
        000626  005200                                          INC R0
        000630  02
0027    000567
        000634  003771                                  CMP R0,#567
        000636                                                  BLE B5
                                                    E5:::::::
     95 000636                                  END ALPHA
        000636                                              E3:::::::

     96                                 ;$RETURN EXAMPLES
     97 000636                                  $RETURN
        000636  000207
                                RTS PC
     98 000640                                  $RETURN ERROR
        000640  000261                                          SEC
        00
0642    000207                                          RTS PC
     99 000644                                  $RETURN NOERROR
        000644  00024
1                                                       CLC
        000646  000207                                          RTS PC
    100                                 ;CASE EXAMPLES
    101 000650  013700  000000                  MOV     A,R0
    102 000654                                  CASE R0
        000654  0
10046                                                   MOV R0,-(SP)
        000656  006316                                          ASL @SP
        000660  004737
        000700                                          JSR PC,L24
    103 000664  000000                      A
```

```
    104 000666  000
002                 B                                                   SEQ 0148
    105 000670  000004                      C
    106 000672  000006                      D
    1
07      000674  000010                      E
    108 000676  000012                      F
    109 000700                          END
:OF CASE R0
        000700                                          L26:::::::
        000700  062616                                          ADD (SP)+,@
SP
        000702  013646                                          MOV @(SP)+,-(SP)
        000704  004736                                          JSR PC
,@(SP)+
    110
    111         000001                      .END
```

7.6 Banks & Boards (MK11)

Boards with 4K MOS chips are 32K words each.
Boards with 16K MOS chips are 128K words each.

Imagine that the front view of the memory box is as follows:

BL,15
,13,11,9,7,5,3,1,CB,CA,DA,BL,AD,BL,CA,CB,0,2,4,6,8,10,12,14,BL

Where 0 thru 15 are the MOS array cards. CB is Control 'B'. CA is Control 'A'. DA is the Data Interface. AD is the Address Interface. BL is a Blank (unwired) slot in the backplane.

```
4K Parts with            No Interleave

Array   15,13,11, 9, 7, 5, 3,
1, 0, 2, 4, 6, 8,10,12,14
Banks   36 32 26 22 16 12  6  2  0  4 10 14 20 24 30 34

        37 33 27 23 17 13  7  3  1  5 11 15 21 25 31 35

4K Parts with            Internal I
nterleave

Array   15,13,11, 9, 7, 5, 3, 1, 0, 2, 4, 6, 8,10,12,14
Banks   34 30
 24 20 14 10  4  0  0  4 10 14 20 24 30 34
        35 31 25 21 15 11  5  1  1  5 11 15
 21 25 31 35
        36 32 26 22 16 12  6  2  2  6 12 16 22 26 32 36
        37 33 27 23 17
 3  7  3  3  7 13 17 23 27 33 37


4K Parts with            2-1 External  No Internal
 Interleave

Array   15,13,11, 9, 7, 5, 3, 1, 0, 2, 4, 6, 8,10,12,14
Banks   74
64 54 44 34 24 14  4  0 10 20 30 40 50 60 70
        75 65 55 45 35 25 15  5  1 11 21
31 41 51 61 71
        76 66 56 46 36 26 16  6  2 12 22 32 42 52 62 72
        77 67 57 47 3
7 27 17  7  3 13 23 33 43 53 63 73


4K Parts with            2-1 External  Internal
Interleave

Array   15,13,11, 9, 7, 5, 3, 1, 0, 2, 4, 6, 8,10,12,14
Banks   70 6
0 50 40 30 20 10  0  0 10 20 30 40 50 60 70
        71 61 51 41 31 21 11  1  1 11 21 3
1 41 51 61 71
        72 62 52 42 32 22 12  2  2 12 22 32 42 52 62 72
        73 63 53 43 3
3 23 13  3  3 13 23 33 43 53 63 73
        74 64 54 44 34 24 14  4  4 14 24 34 44 54 6
4 74
        75 65 55 45 35 25 15  5  5 15 25 35 45 55 65 75
        76 66 56 46 36 26 16  6
  6 16 26 36 46 56 66 76
        77 67 57 47 37 27 17  7  7 17 27 37 47 57 67 77

4
K Parts with             4-1 External  No Internal Interleave
```

```
Array   15, 13, 11,  9,  7,
   5,  3,  1,  0,  2,  4,  6,  8, 10, 12, 14
Banks       150 130 110 70  50  30  1
0   0  20  40  60  100 120 140 160
            152 132 112 72  52  32  12   2  22  42
 62  102 122 142 162
            152 133 113 73  53  33  13   3  23  43  63  103 123 1
43 163
            154 134 114 74  54  34  14   4  24  44  64  104 124 144 164
            1
55 135 115 75  55  35  15   5  25  45  65  105 125 145 165
            156 136 116 76
 56  36  16   6  26  46  66  106 126 146 166
            157 137 117 77  57  37  17
   27  47  67  107 127 147 167
```

SEQ 0151

```
4K Parts with          4-1 External  Internal Int
erleave

Array   15, 13, 11,  9,  7,  5,  3,  1,  0,  2,  4,  6,  8, 10, 12, 14

Banks   160 140 120 100  60  40  20   0   0  20  40  60  100 120 140 160
        161 1
41 121 101  61  41  21   1   1  21  41  61  101 121 141 161
        162 142 122 102  6
2  42  22   2   2  22  42  62  102 122 142 162
        163 143 133 103  63  43  23   3
   3  23  43  63  103 123 143 163
        164 144 124 104  64  44  24   4   4  24  44
 64  104 124 144 164
        165 145 125 105  65  45  25   5   5  25  45  65  105 125
145 165
        166 146 126 106  66  46  26   6   6  26  46  66  106 126 146 166
        167
 147 127 107  67  47  27   7   7  27  47  67  107 127 147 167
            150 130 110
 70  50  30  10  10  30  50  70  110 130 150
            151 131 111  71  51  31  11
11  31  51  71  111 131 151
            152 132 112  72  52  32  12  12  3'  52  72  1
12 132 152
            153 133 113  73  53  33  13  13  33  53  73  113 133 153

154 134 114  74  54  34  14  14  34  54  74  114 134 154
            155 135 115  75
55  35  15  15  3?  55  75  115 135 155
            156 136 116  76  56  36  16  16  3
6  56  76  116 136 156
            157 137 117  77  57  37  17  17  37  57  77  117 13
7 157

16K Parts with         No Interleave

Array   15, 13, 11,  9,  7,  5,  3,  1
,  0,  2,  4,  6,  8, 10, 12, 14
Banks       150 130 110 70  50  30  10   0  20
40  60  100 120 140 160
            151 131 111 71  51  31  11   1  21  41  61  101 12
1 141 161
            152 132 112 72  52  32  12   2  22  42  62  102 122 142 162

  153 133 113 73  53  33  13   3  23  43  63  103 123 143 163
            154 134 114
74  54  34  14   4  24  44  64  104 124 144 164
            155 135 115 75  55  35  15
   5  25  45  65  105 125 145 165
            156 136 116 76  56  36  16   6  26  46
66  106 126 146 166
            157 137 117 77  57  37  17   7  27  47  67  107 127 14
```

SEQ 0155

16K Parts with Internal Interleave

```
Array   15, 13, 11,  9,  7,
 5,  3,  1,  0,  2,  4,  6,  8, 10, 12, 14
Banks   160 140 120 100 60  40  20   0
   0  20  40  60  100 120 140 160
        161 141 121 101 61  41  21   1   1  21  41
61  101 121 141 161
        162 142 122 102 62  42  22   2   2  22  42  62  102 122 14
2 162
        163 143 123 103 63  43  23   3   3  23  43  63  103 123 143 163
        164 14
4 124 104 64  44  24   4   4  24  44  64  104 124 144 164
        165 145 125 105 65
45  25   5   5  25  45  65  105 125 145 165
        166 146 126 106 66  46  26   6   6
  26  46  66  106 126 146 166
        167 147 127 107 67  47  27   7   7  27  47  67
107 127 147 167
            150 130 110 70  50  30  10  10  30  50  70  110 130 150

    151 131 111 71  51  31  11  11  31  51  71  111 131 151
            152 132 112 72
  52  32  12  12  32  52  72  112 132 152
            152 133 113 73  53  33  13  13
33  53  73  113 133 153
            154 134 114 74  54  34  14  14  34  54  74  114 13
4 154
            155 135 115 75  55  35  15  15  35  55  75  115 135 155
            156 13
6 116 76  56  36  16  16  36  56  76  116 136 156
            157 137 117 77  57  37
17  17  37  57  77  117 137 157
```

```
16K Parts with          2-1 External and No Interna
l  Interleave
Array   15, 13, 11,  9,  7,  5,  3,  1,  0,  2,  4,  6,  8, 10, 12,
 14
Banks                   160 120 60  20   0  40  100 140
                        161 121 61  21
1  41  101 141
                        162 122 62  22   2  42  102 142
                        163 123 63  23   3  43  1
03 143
                        164 124 64  24   4  44  104 144
                        165 125 65  25   5  45  105 145
                        166 126 66  26   6  46  106 146
                        167 127 67  27   7  47  107 147
                            1
30 70  30  10  50  110 150
                            131 71  31  11  51  111 151
                            132 72  3
2  12  52  112 152
                            133 73  33  13  53  113 153
                            134 74  34  14  5
4  114 154
                            135 75  35  15  55  115 155
                            136 76  36  16  56  116 1
56
                            137 77  37  17  57  117 157

16K Parts with          2-1 External and Int
ernal Interleave
Array   15, 13, 11,  9,  7,  5,  3,  1,  0,  2,  4,  6,  8, 10,
12, 14
Banks                   140 100 40   0   0  40  100 140
                        141 101 41   1   1  41  101
141
                        142 102 42   2   2  42  102 142
                        143 103 43   3   3  43  103 143

144 104 44   4   4  44  104 144
                        145 105 45   5   5  45  105 145
                        146 106
46   6   6  46  106 146
                        147 107 47   7   7  47  107 147
                        150 110 50  10
10  50  110 150
                        151 111 51  11  11  51  111 151
                        152 112 52  12  12  52
112 152
                        153 113 53  13  13  53  113 153
                        154 114 54  14  14  54  114 154

                        155 115 55  15  15  55  115 155
                        156 116 56  16  16  56  116 156
                        157
117 57  17  17  57  117 157
```

```
                                160 120 60  20  20  60  120 160
                                161 121 61
 21  2   6   12  161
                                162 122 62  22  22  62  122 162
                                163 123 63  23  23
63  123 163
                                164 124 64  24  24  64  124 164
                                165 125 65  25  25  65  125
165
                                166 126 66  26  26  66  126 166
                                167 127 67  27  27  67  127 167

    130 70  30  30  70  130
                                    131 71  31  31  71  131
                                    132 72  32
32  72  132
                                    133 73  33  33  73  133
                                    134 74  34  34  74  134

    135 75  35  35  75  135
                                    136 76  36  36  76  136
                                    137 77  37
37  77  137
```

16K Parts with 4-1 External and No Internal Interleave

Array Banks	15,	13,	11,	9,	7,	5,	3,	1,	0,	2,	4,	6,	8,	10,	12,	14
40	0	100					140									
							141	41	1	101						
							142	42	2	102						
							143	43	3	103						
							144	44	4	104						
							145	45	5	105						
							146	46	6	106						
							147	47	7	107						
							150	50	10	110						
							151	51	11	111						
							152	52	12	112						
							153	53	13							
113																
							154	54	14	114						
							155	55	15	115						
							156	56	16	116						
							157	57								
17	117															
							160	60	20	120						
							161	61	21	121						
							162	62	22	122						
							163									
63	23	123														
							164	64	24	124						
							165	65	25	125						
							166	66	26	126						
167	67	27	127													
								70	30	130						
								71	31	131						
								72	32	132						
								73	33	133						
								74	34	134						
								75	35	135						
								76	36	1						
36																
								77	37	137						

16K Parts with 4-1 External and Internal Interleaving

```
Array   15, 13, 11,  9,  7,  5,  3,  1,  0,  2,  4,  6,  8, 10, 12, 14
Banks
                                    100  0   0  100
                                    101  1   1  101
                                    102  2   2  102
                                    103  3   3  1
03
                                    104  4   4  104
                                    105  5   5  105
                                    106  6   6  106
                                    107  7
7  107
                                    110 10  10  110
                                    111 11  11  111
                                    112 12  12  112
                                    113 1
3  13  113
                                    114 14  14  114
                                    115 15  15  115
                                    116 16  16  116
                                    1
17 17  17  117
                                    120 20  20  120
                                    121 21  21  112
                                    122 22  22  122

                          123 23    23  123
                                    124 24  24  124
                                    125 25  25  125
                                    126 26  26  12
6
                                    127 27  27  127
                                    130 30  30  130
                                    131 31  31  131
                                    132 32  32
   132
                                    133 33  33  133
                                    134 34  34  134
                                    135 35  35  135
                                    136 36
   36  136
                                    137 37  37  137
                                    140 40  40  140
                                    141 41  41  141
                                    14
2  42  42  142
                                    143 43  43  143
                                    144 44  44  144
                                    145 45  45  145

                  146 46  46  146
```

147 47 47 147
150 50 50 150
151 51 51 151

152 52 52 152
153 53 53 153
154 54 54 154
155 55 55

155

156 56 56 156
157 57 57 157

160 60 60 160
161 61
61 161
162 62 62 162
163 63 63 163
164 64 64 164
16
5 65 65 165
166 66 66 166
167 67 67 167
70 70
71 71
72 72
73 73
74 74
75 75
76 76
77 77

7.7 Memory Management Mapping

PAR NEL	SUPERVISOR USER	KER	
---	---	---	---
0	Program	Program	Src Bk/Fst Mem
1	Program	Program	Src Bk/Fst Mem
2	Program	Program	Src Bk/Fst Mem
3	Test Area	Program	Src Bk/Fst Mem
4	Test Area	Program	Dst Bk/Fst Mem
5	Test Area	Program	Dst Bk/Fst Mem
6	Test Area	Map to CSR's	Dst Bk/Fst Mem
7	Perif Page	Perif Page	Dst Bk/Fst Mem

7.8 Listing Format

The program listing is in two parts. The first part is a compl
ete
listing the way it was used by the author. Macros are not expanded
and
an effort was made to keep each section on one or two pages. The
second part
is a complete listing with all macros expanded to show all
generated code in a
program locations. This last listing is for
those who have a need to lo
ok at the actual assembly language code and
the generated binary.

You see -
you can have you're cake and eat it too.

8.0 MULTIPORT SYSTEM ORGANIZATION

The multiport section of the MKAll Diagnostic runs after the comple-
tion o
f testing as a single port system but before the end-of-pass
code.

The te
sts are performed on a Master-slave basis with the Master being
the CPU that t
he diagnostic is started at.

8.1 Starting Slaves

The Master will us
e the IIST and Multiprocessor boot to start and
identify all slave CPU's
with software locks to insure that only one
CPU runs at a time (not ASR8 locks
). If the IIST or Multiprocesso
Boot is not available they may be bypasse
d by starting at address 204
and following the dialogue for manual intervention
.

8.1.1 Starting Code -

As each slave starts it executes shared co
de with the master using
it's own unique stack. The master has set the
''CPUBIT'' to indicate
slave status and loops until the slave started places his
unique IIST
ID number (or System ID number if IIST's are bypassed) in the port
di-
rectory. This is done for each slave, afterwhich the master set's the
''C
PUBIT'' to indicate master status.

Each slave when started sizes memory indica
ting accessed banks via a
Bit Set of the ''CPUBIT'' into the configuration ta
ble. If IIST's are
in use it enables interrupts on it's IIST, lowers it's prio
rity to 4
and executes a WAIT until the master wakes it up. If IIST's are
by-

passed it moves a little program into the User PAR's and Jumps to it. This program waits for the master to write a countdown from 10 to 0 in the slaves pseudo TTY buffer location. Either way this is known as the Sleep state.

After all slaves have been put to sleep the master checks the port directory of ID numbers and insures that each CPU has a unique number.

Testing is now started as in a normal single port environment. Each slave remains dormant during this time.

8.2 Multiport Testing

The master wakes each slave via a
n interrupt with the IIST (or if
IIST's are bypassed via a countdown).
The master then orders each
slave to run the MK11 CSR tests. The master now
orders each slave to
relocate to a unique memory bank that has no errors. Us
ually this is
puts slave 1 in Bank 1, slave 2 in Bank 3 and slave 3 in bank 4).

The master then directs each slave and also himself in the execution
of t
he following tests.

Access Paths Test

Address Test
Asychronous Access Address Un
iqueness Test
Skewed Up Address Test

Port Arbitration Symmetry Test
I/O Priority T
est
Execution Contention Test

ASRB Test
CACHE Flush Test

Next the master orders
each slave to stop and each slave will map back
into bank 0 (shared code area)
, lower it's priority to 4 and execute a
wait instruction thereby sleeping unti
l the next pass.

The master then returns to single port testing just prio
r to the
end-of-pass code.

8.2.1 Access Paths Test -

The master causes
each CPU (making himself a slave when necessary) to
write into memory and all
other CPU's to simultaneously read.

This is done as follows:

```
            FOR EACH CPU
                  FOR EACH BANK

        IF BANK IS ACCESSABLE & NOT PROGRAM SPACE
                        FO
R EACH OF 5 PATTERNS
                              SELECTED CPU WRITES

                    ALL OTHER CPU'S READ
                          NEXT PATTERN

                      NEXT BANK
                    NEXT CPU
```

8.2.2 Address
Test -

The master causes each CPU (making himself a slave when necessary) t
o
write an address pattern into memory and all other CPU's to simultane-
ously
read.

This is done as follows:

```
                    FOR EACH CPU

                    FOR EACH BANK
                        IF BANK IS ACCESSABLE
 & NOT PROGRAM SPACE
                          FOR EACH ADDRESS PATTERN

                    --AND COMPLEMENT ADDRESS PATTERN

  SELECTED CPU WRITES
                             ALL OTHER CPU'S READ

                   NEXT PATTERN
                      NEXT BANK

      NEXT CPU
```

8.2.3 Asychronous Access Address Uniqueness Test -

Th
e master causes each CPU (making himself a slave when necessary) to
test 5 pa
tterns on 1/4 bank simultaneously. This insures that no ad-
dress errors will
allow corruption of another CPU's data.

This is done as follows:

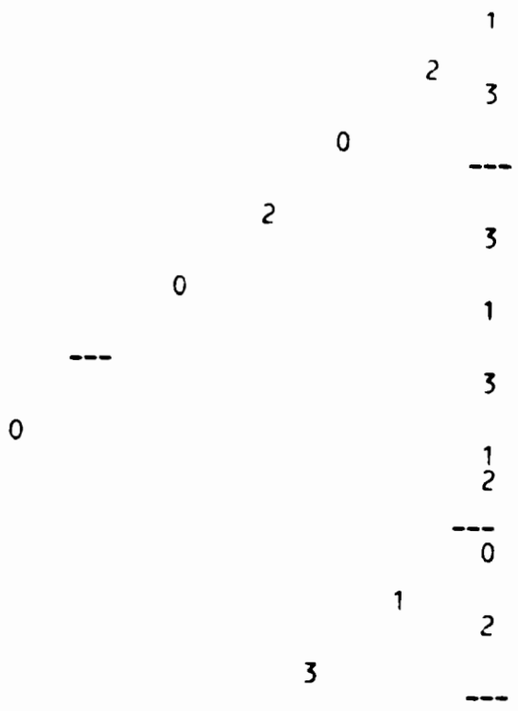
```
                FOR EACH BANK
                     IF BANK IS ACCESSABLE & NO
* PROGRAM SPACE
                       FOR EACH OF 4 STARTING ADDRESSES

                    FOR EACH OF 5 PATTERNS
                                EACH CP
U TESTS 5 PATTERNS ASYNCHRONOUSLY
                              NEXT PATTERN

                   NEXT STARTING ADDRESS
                    NEXT BANK
```

8.2.4
Skewed Up Address Test -

The master causes each CPU (making himself a slave when necessary) to write and read there IIST ID number in every 4th address - skewed by 1 address and offset by there IIST ID number. Assuming a 4 CPU system then example data would be.



This is done as follows:

FOR EACH BANK
IF BANK IS ACCESSABLE & NOT PROGRAM SPACE
FOR EACH OF 4 STARTING ADDRESSES

EACH CPU RUNS THE SKEWED UP ADDRESS TEST
--OFFSET BY

IT'S IIST ID

NEXT STARTING ADDRESS

SEQ 0168

NEXT BANK

8.2.5 Port Arbitration Symmetry Test -

The master causes each CPU (making himself a slave when necessary) to access (with memory fetches o f MOV R5,R5 instructions) the same loca- tion 64K times. Each slave executes o ut of the memory bank under test thereby increasing the probability of conten tion. While this access loop is executing each slave is counting tics of the line clock (KW11L) under interrupt control.

After each slave completes his access test he passes his tic count back to the master for analysis.

The master checks every bodies tic count against his own and if any differ by more than 2 tics he reports an error.

This is done as follows:

```
                    FOR EACH BANK
                       IF BANK IS ACCESSABLE &
NOT PROGRAM SPACE
                            ALL CPU'S RUN CONTENTION TEST

                    CHECK TIC COUNTER FOR BALANCE
                      NEXT BANK
```

8.2.6 I/O Priority Test -

This tests the ability of the memory port to giv
e I/O higher priority
than CPU accesses.

Since the difference is difficult
to measure on small configurations
this test is only run when there are 4 CPU
's present.

The master causes each CPU (except one) to raise his priority to
that
of I/O. This is done by setting a margin of 6 in the maintenance re-
g
ister of the PDP11-70.

The master causes all CPU's to run the same assess tes
t as the "Port
arbitration symmetry test". In the symmetry test the maste
r checks
for a balance. In this test the master checks for an lack of balance.

This is done as follows:

```
                FOR EACH BANK

            IF BANK IS ACCESSABLE & NOT PROGRAM SPACE

  FOR EACH CPU BEING LOW PRIORITY
                    ALL CPU'S BUT ONE S
ET FOR I/O PRIORITY
                    ALL CPU'S RUN CONTENTION TEST

                  CHECK TIC COUNTER FOR LACK OF BALANCE

      NEXT CPU
                NEXT BANK
```

8.2.7 Execution Contention T
est -

The master causes each CPU (Making himself a slave when necessary) to

execute random instructions (INC (R0) or TST (R0)) simultaneously out
of sha
red program space.

Success is indicated by survival & correct count in locat
ion pointed
to by R0.

This is done as follows:

```
 FOR EACH BANK
                      IF BANK IS ACCFSSABLE & NOT PROGRAM SPACF

                        SETUP RANDOM INSTRUCTIONS
                        ALL
CPU's EXECUTE IN BANK
                        CHECK COUNTERS FOR ALL EQUAL

                  NEXT BANK
```

8.2.8 ASRB Test -

In a multi-processo
r system, certain portions of main memory must be
capable of locking out
all other references during the DATIP-DATO
cycle. This is accomplished throug
h a hardware and software LOCK pro-
cess

8.2.8.1 Software Lock -

The Arithmetic Shift Right Byte (ASRB) instruction is used to attempt
ownershi
p of a particular block of shared data and/or code which may
include I/O rout
ines, data dependent routines, and etc. The ASRB in-
struction changes the s
tate, (the UNLOCKed state or free state is de-
fined as a binary 1 and the LOCK
ed state is defined as a binary 0), of

the control byte's destination location associated with the data structure/code being accessed; if that location is in the UNLOCKed state. The C bit of the PSW will store the information (0 if LOCK, 1 if UNLOCK) resulting from data manipulation during the LOCK/UNLOCK routine. The ASRB instruction is followed by a BCS (Branch if Carry Bit is Set) instruction which will branch and execute the desired code.
When finished the LOCK routine will move a 1 back into the low order bit of the control byte's destination location; indicating to the other processors that this memory block is UNLOCKed. The ASRB instruction maintains its identity as a normal shift instruction.

8.2.8.2 Hardware Lock -

The PDP11/70 multiprocessor modifications treat the ASRB as a DATIP-DATO cycle to main memory bypassing CACHE.

8.2.8.3 ASRB Test Structure -

The master c
auses each CPU (making himself a slave when necessary) to
attempt to lock l
ocation zero of a bank under test simultaneously.
After each attempt the maste
r insures that one and only one CPU was
allowed to lock the test location.
This test is repeated 1000 times
to insure that all CPUs are able to lock the
test location is rela-
tively even distribution (+ or - 256. locks of th
e master). To in-
sure that the test does not syncronize with the memory a
rbitration
scheme every time test is repeated the previous losers (non locker
s)
are given a head start in a chain of NOP instructions and the previous
winn
er is defaulted to the entire chain.

This is done as follows:

```
'
              FOR EACH BANK
                      IF BANK IS ACCESSABLE & NOT P
ROGRAM SPACE
                        FOR ALL 8 POSSIBLE INTERLEAVE ADDRESSES

                         FOR 1000 TRIES
                            UNLOCK TEST
 LOCATION
                            ALL CPUS ATTEMPT LOCK

           RECORD WINNER
                            REARRANGE PRIORITIES

                       CHECK FOR ONE AND ONLY ONE WINNER

    NEXT TRY
                         NEXT INTERLEAVE ADDRESS

   NEXT BANK
                    CHECK FOR EVEN DISTRIBUTION
```

8.2.9 CACHE Flu
sh Test -

The master causes each CPU (making himself a slave when necessary)
to
write fresh data into a double word and all other CPU's to simultane-
ou
sly change the data in that double word - thereby creating stale
data in th
e 1st CPU's CACHE. The 1st CPU then insures that stale data
exists then initia
tes a CACHE Flush and insures that the data is no
longer stale.

Thi
s is done as follows:

IF CACHE IS NOT DISABLED BY THE OPE
RATOR
FOR EACH CPU
FOR EACH BANK

IF BANK IS ACCESSABLE & NOT PROGRAM SPACE

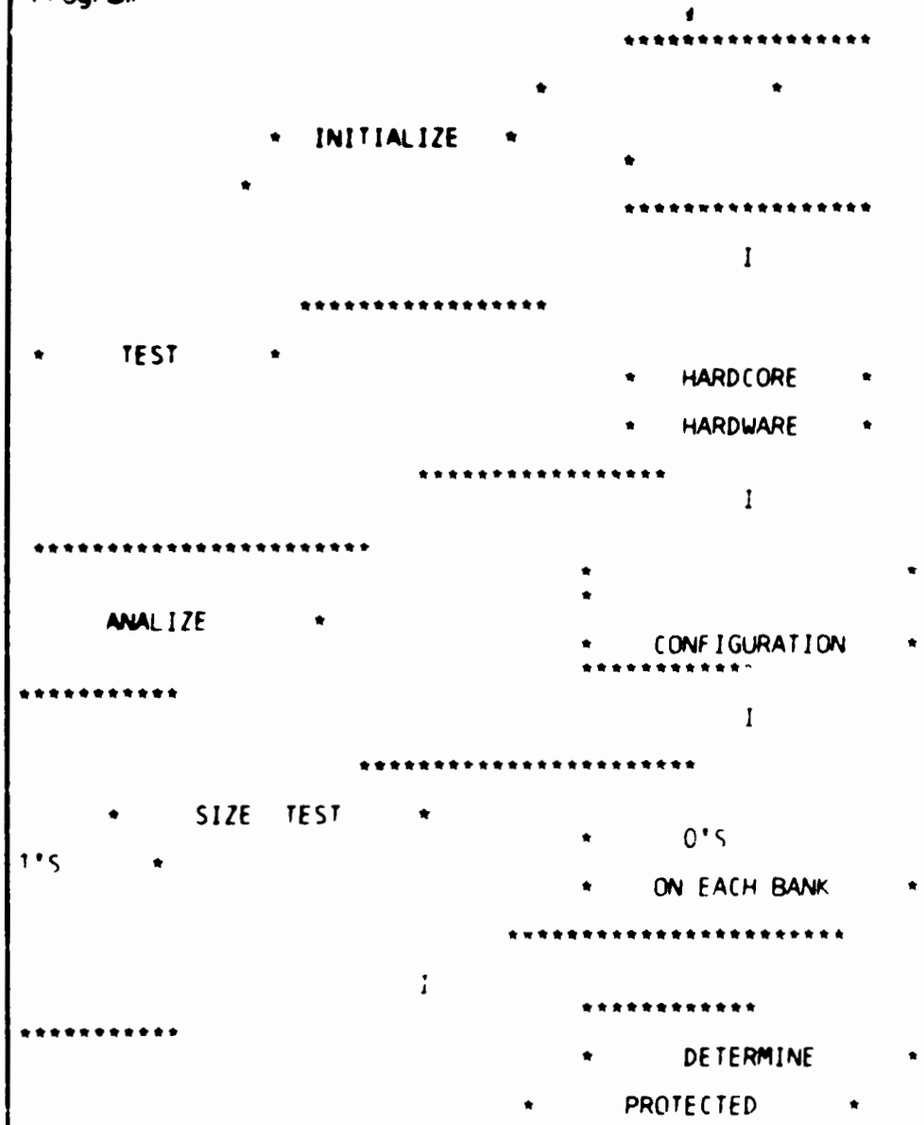
SELECTED CPU WRITES FRESH DATA
A
LL OTHER CPU'S MAKE DATA STALE
SELECTED CPU VERIFYS
STALE DATA
SELECTED CPU DOES CACHE FLUSH

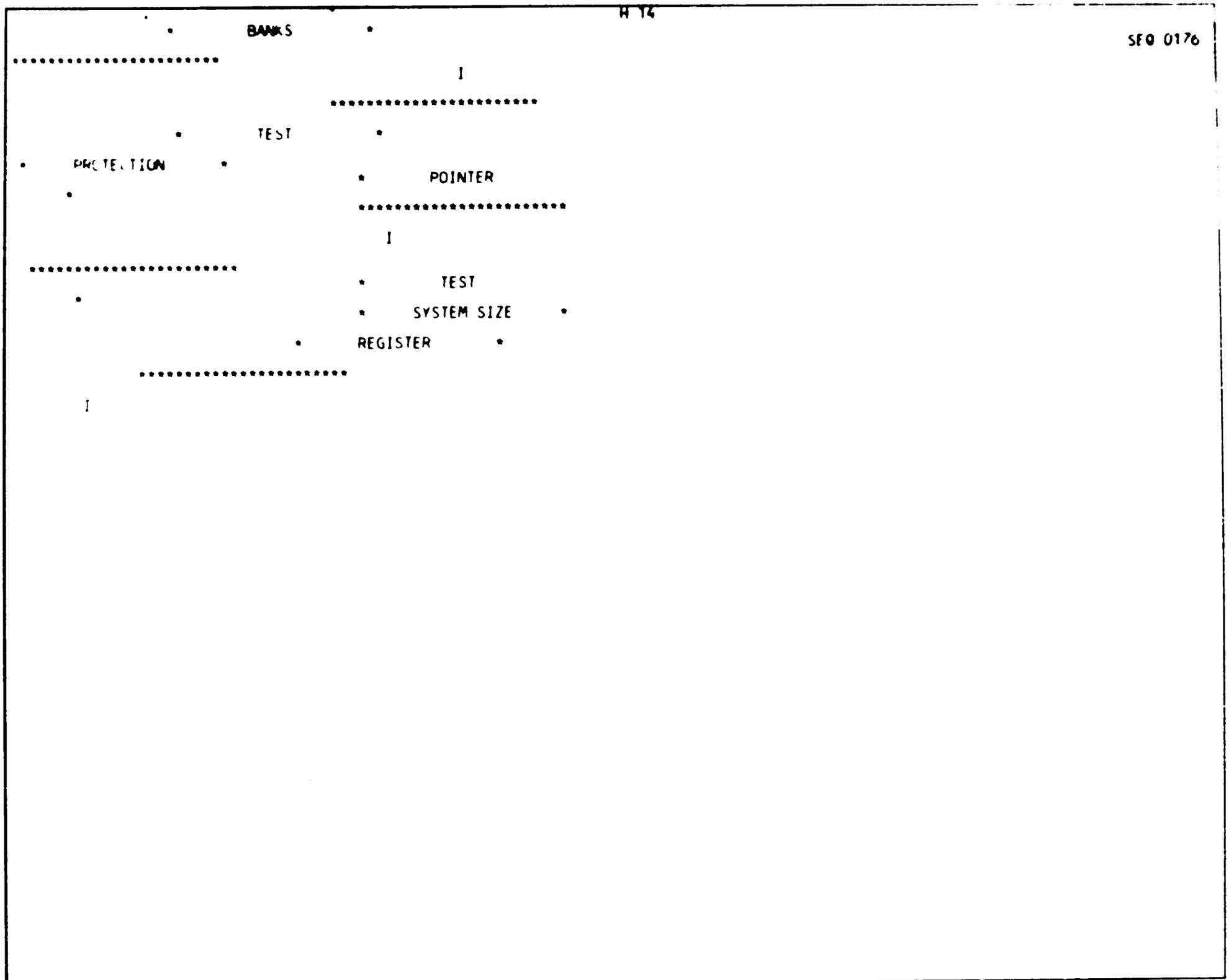
SELECTED CPU VERIFYS NON-STALE DATA

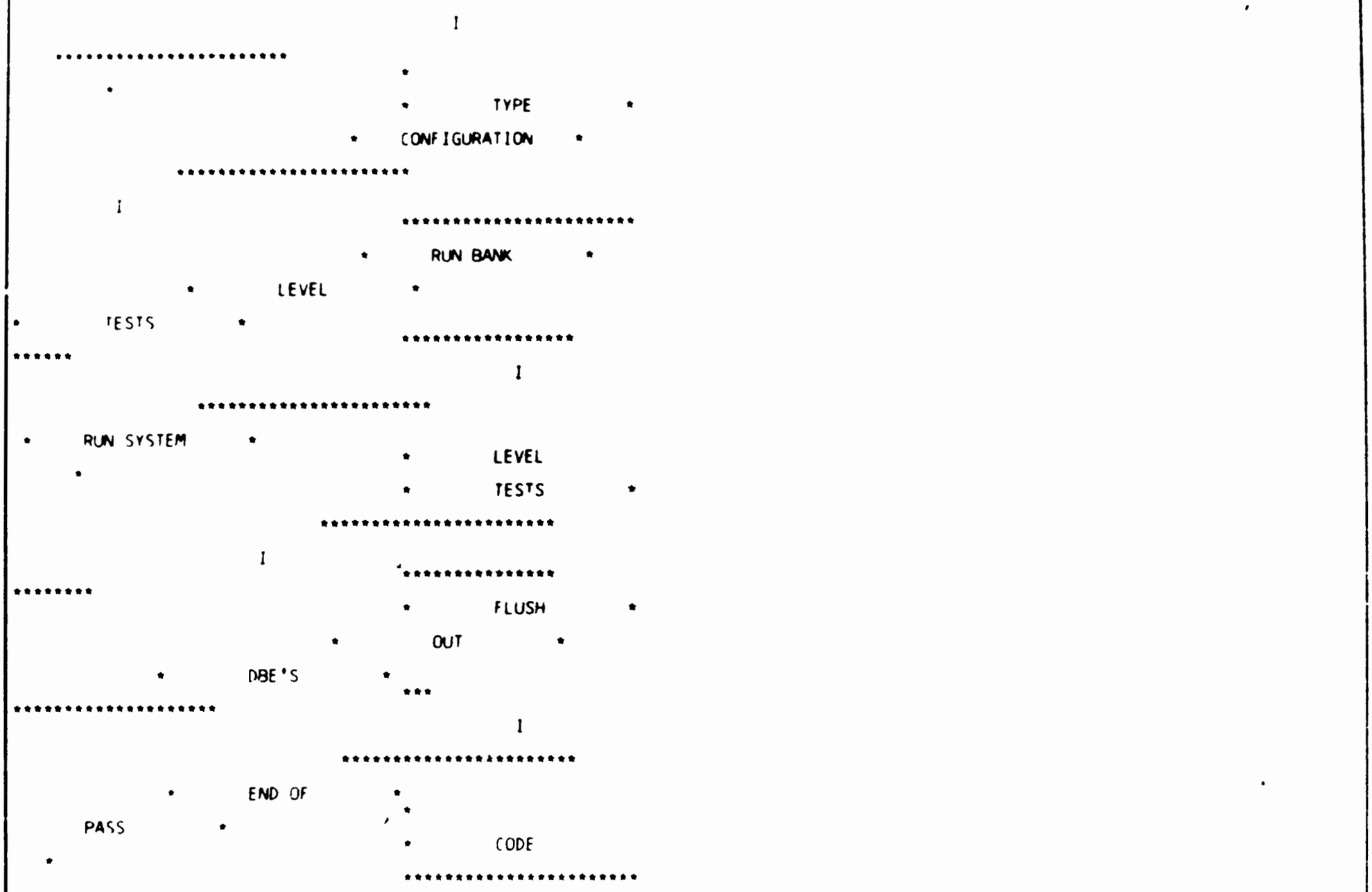
NEXT BANK
NEXT CPU

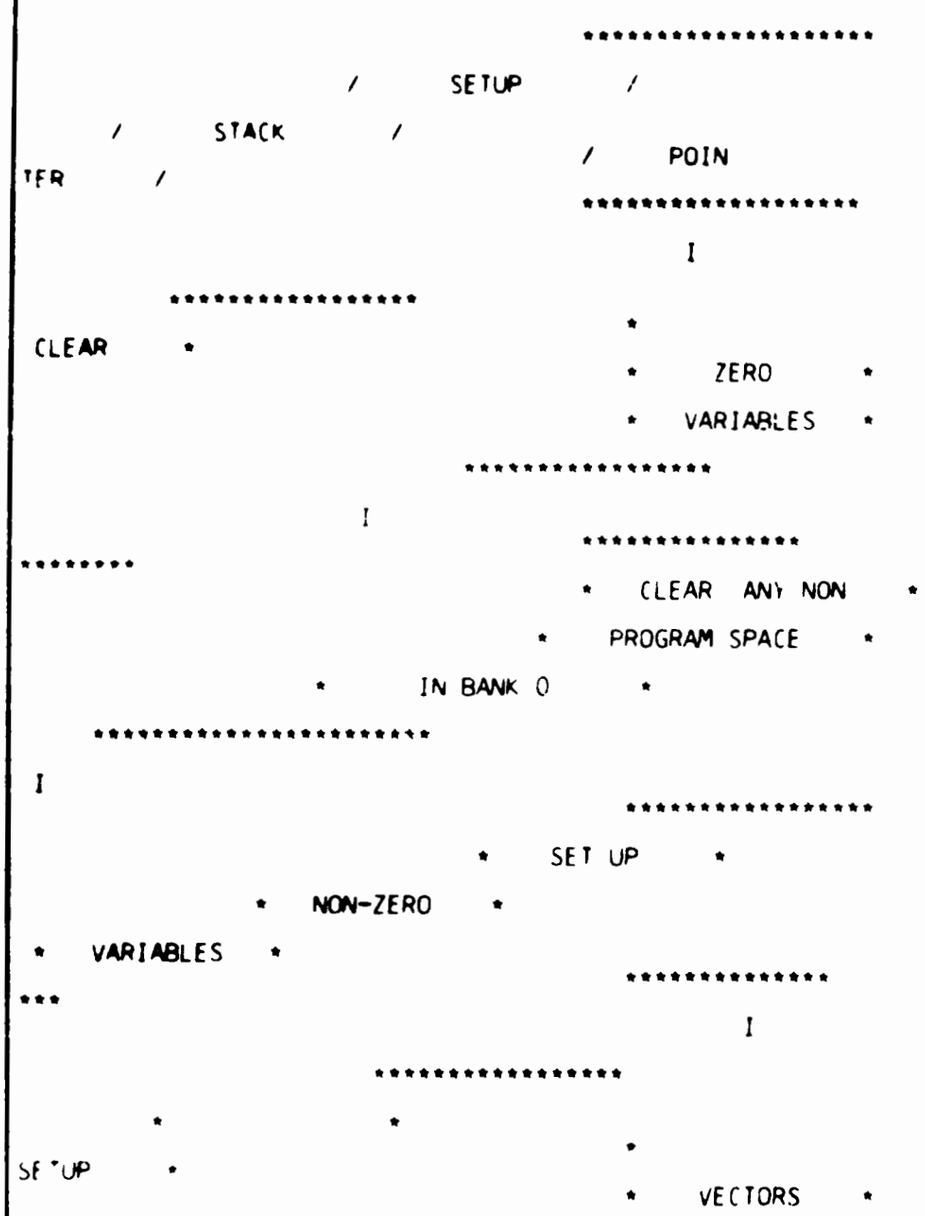
9.0 FLOW CHARTS

9.1 Main Program

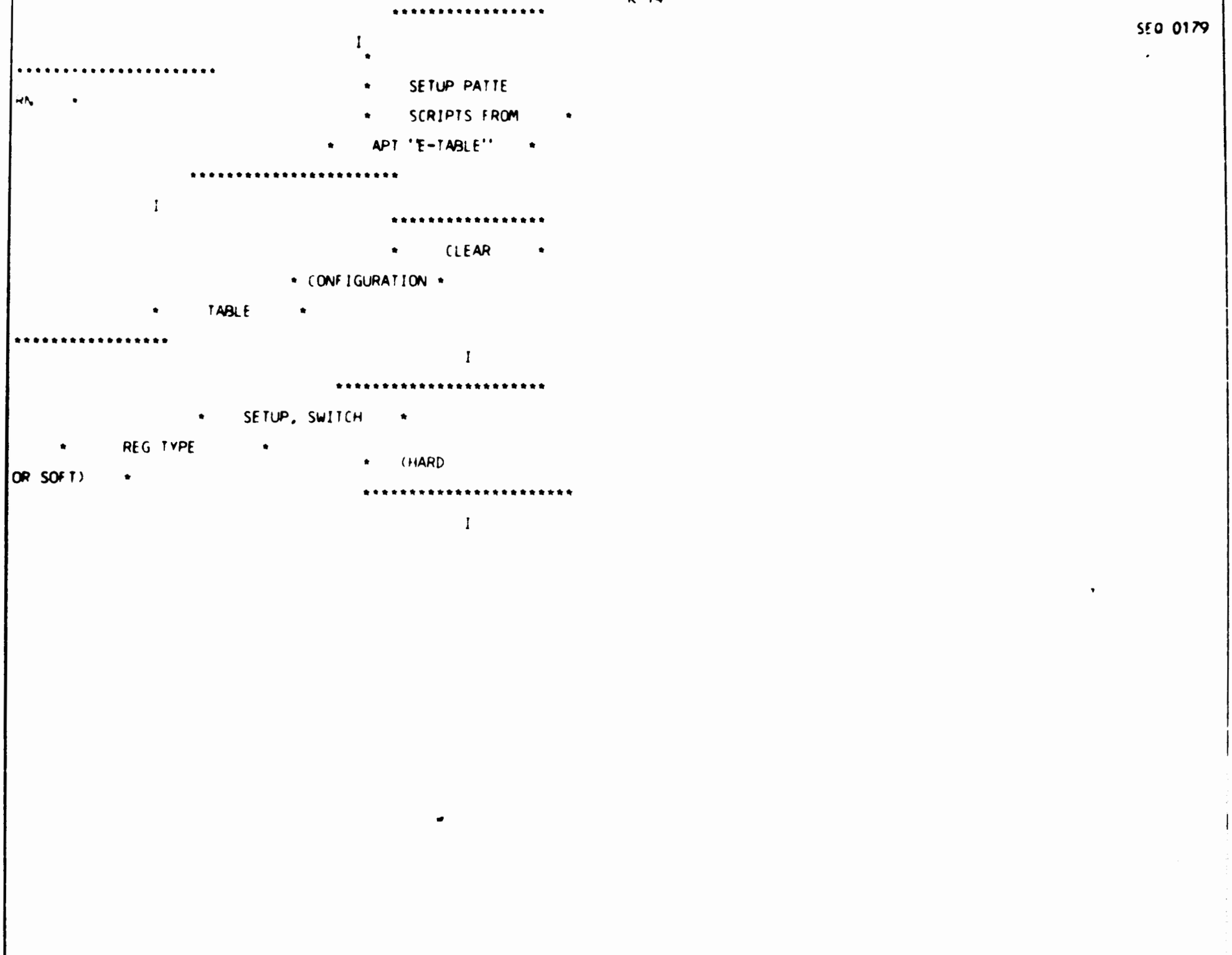


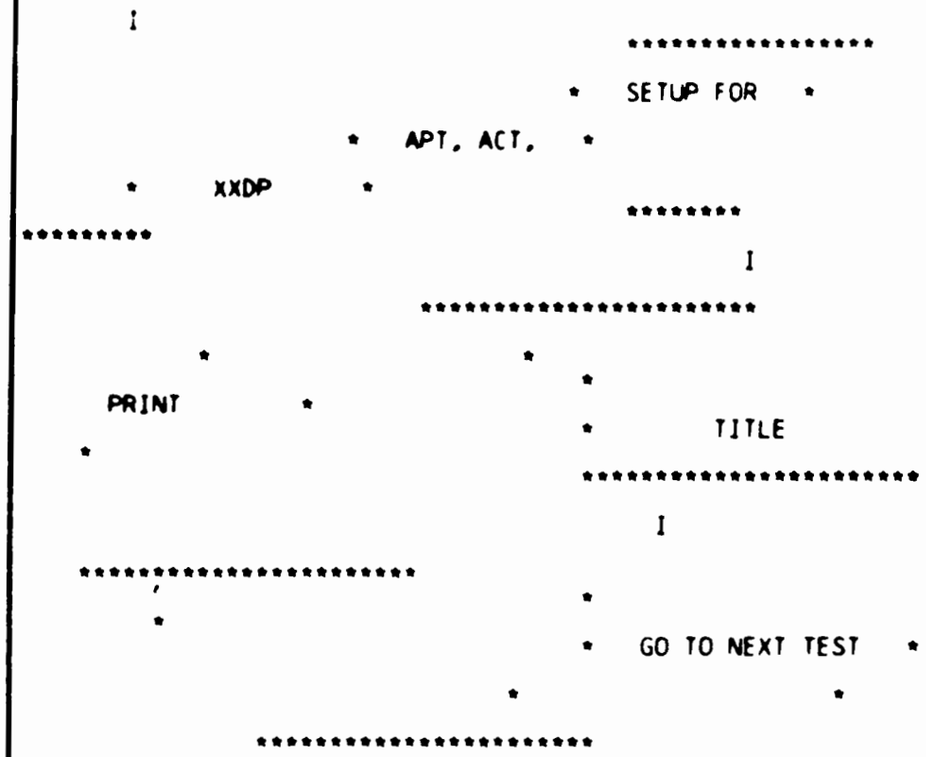

BANKS
TEST
PROTECTION
POINTER
TEST
SYSTEM SIZE
REGISTER


TYPE
CONFIGURATION
RUN BANK
LEVEL
TESTS
RUN SYSTEM
LEVEL
TESTS
FLUSH
OUT
DBE'S
END OF
PASS
CODE

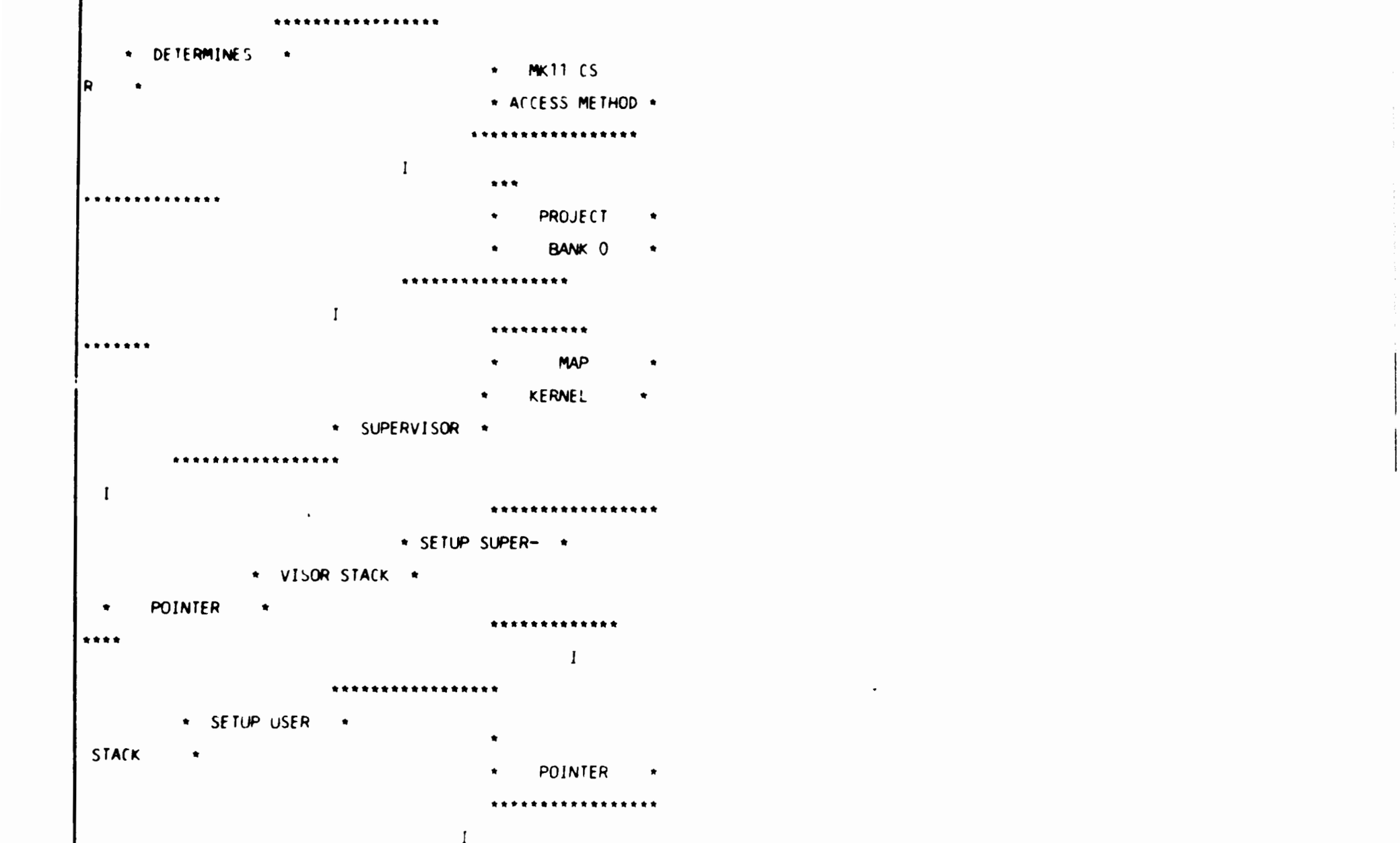

SETUP
STACK
POIN
TER
CLEAR
ZERO
VARIABLES
CLEAR ANY NON
PROGRAM SPACE
IN BANK 0
SET UP
NON-ZERO
VARIABLES
SETUP
VECTORS

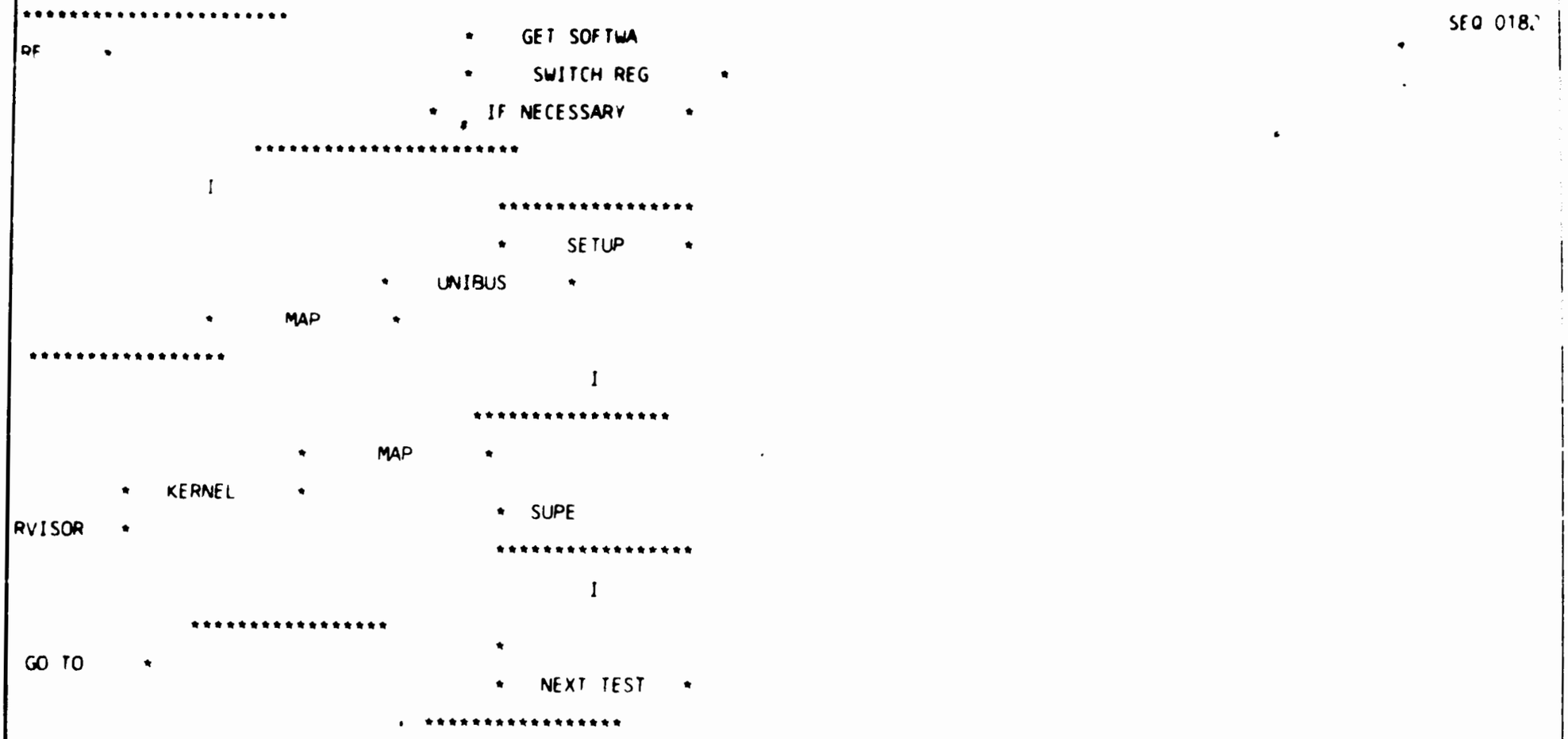
SEQ 0179


SETUP PATTE
SCRIPTS FROM
APT 'E-TABLE''
CLEAR
CONFIGURATION
TABLE
SETUP, SWITCH
REG TYPE
(HARD
OR SOFT)

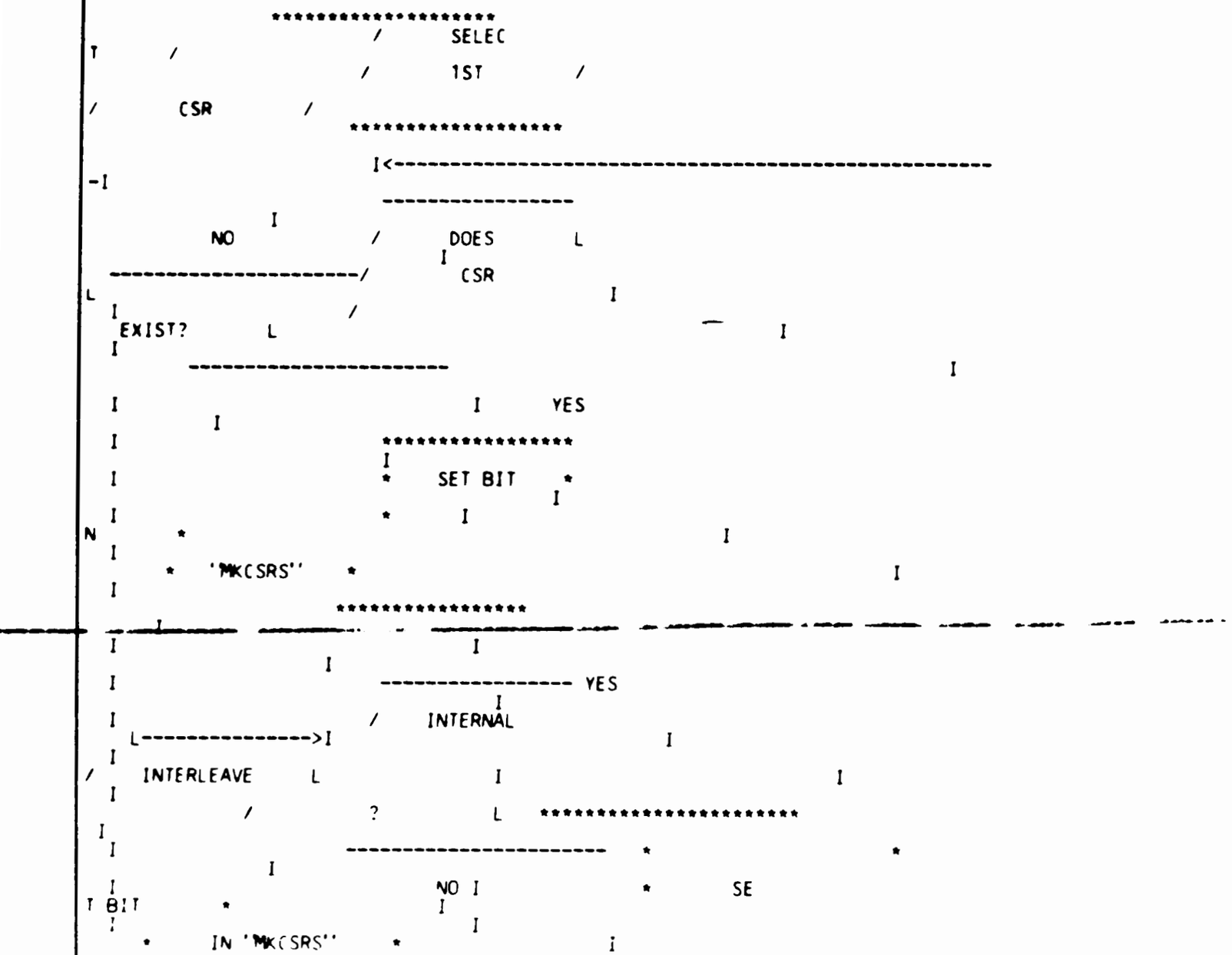

SETUP FOR
APT, ACT,
XXDP
PRINT
TITLE
GO TO NEXT TEST

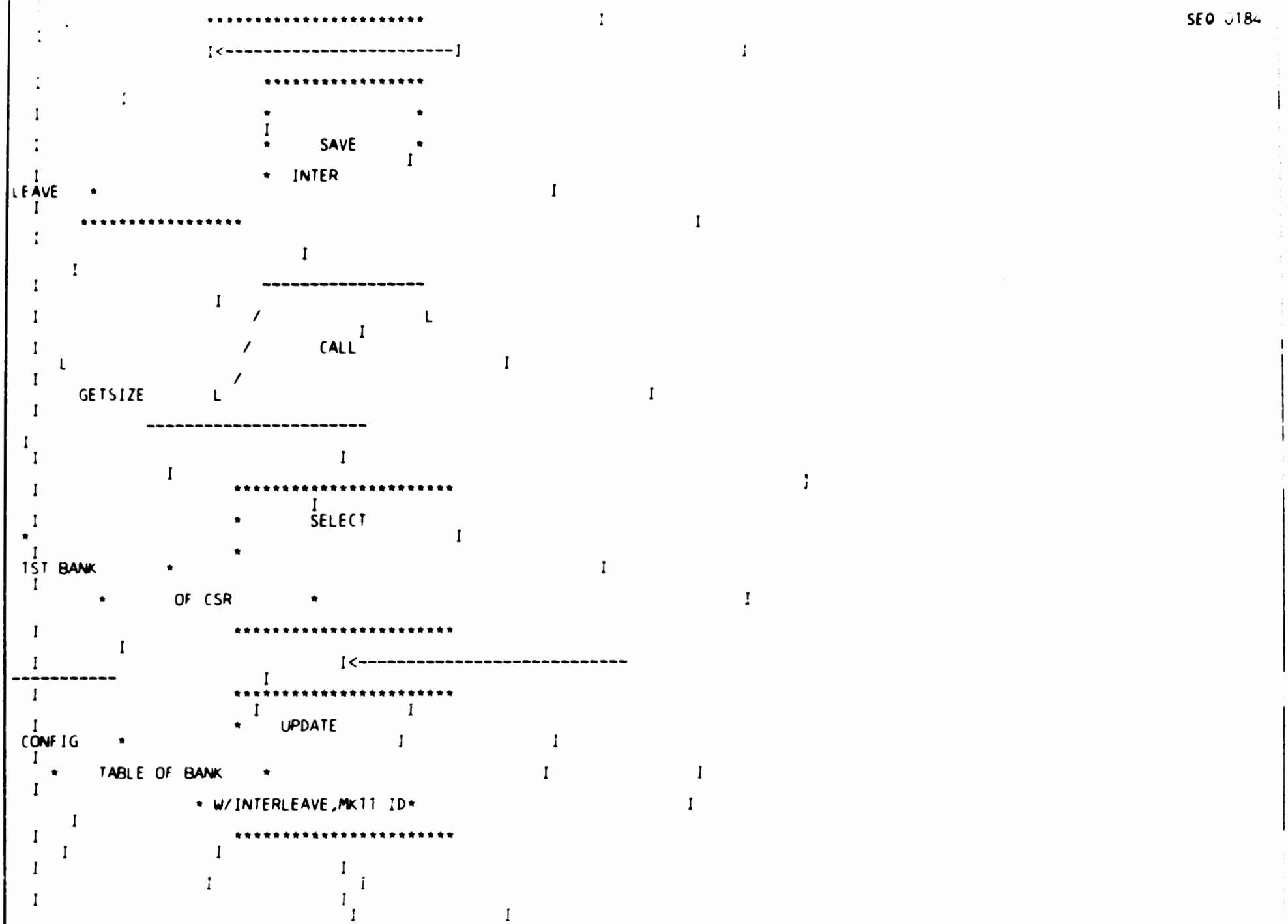
9.1.2 Test Hardcore Hardware -




GET SOFTWA
RE
SWITCH REG
IF NECESSARY
SETUP
UNIBUS
MAP
MAP
KERNEL
SUPE
RVISOR
GO TO
NEXT TEST

9.1.3 Analize Configuration -

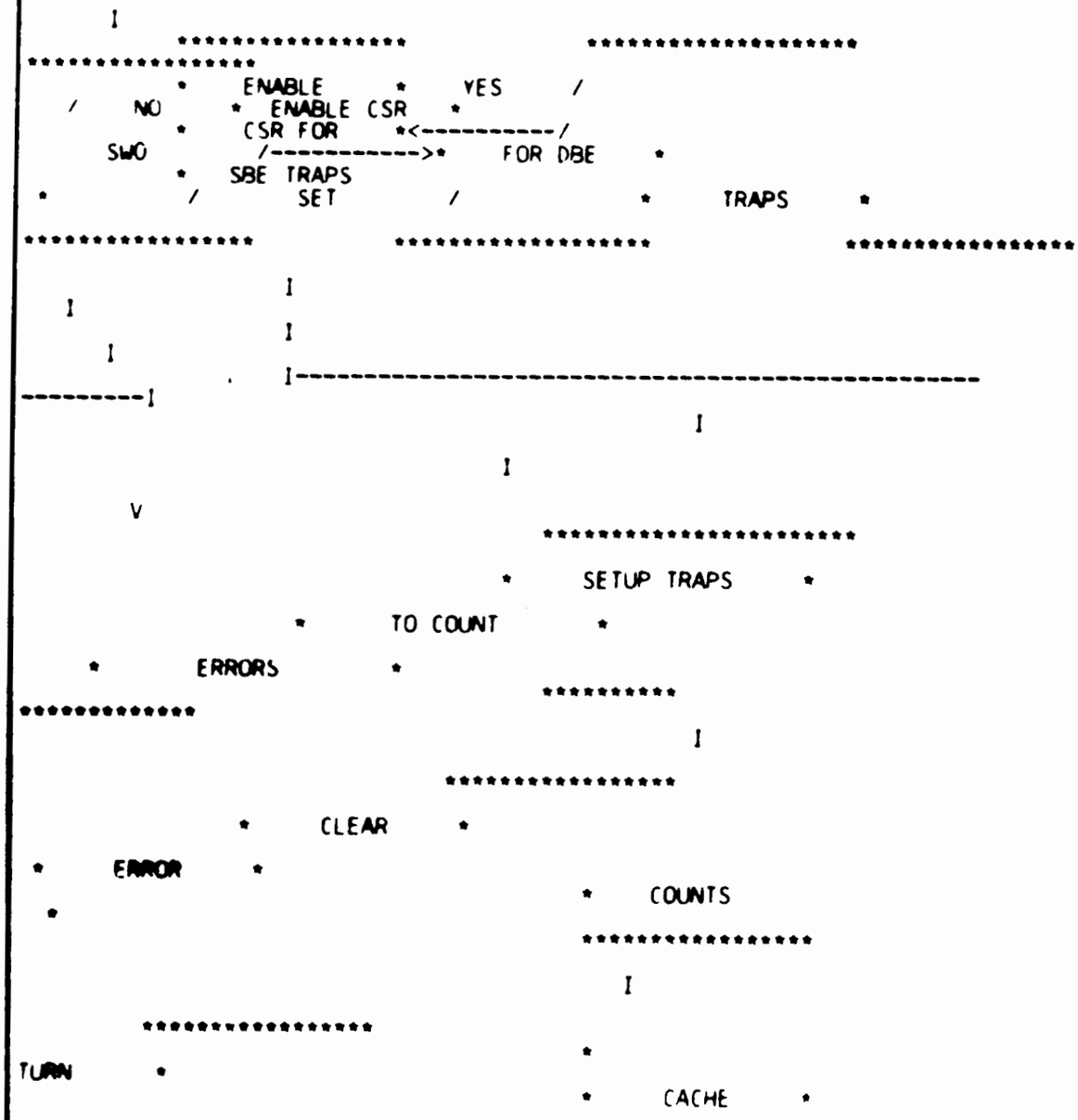


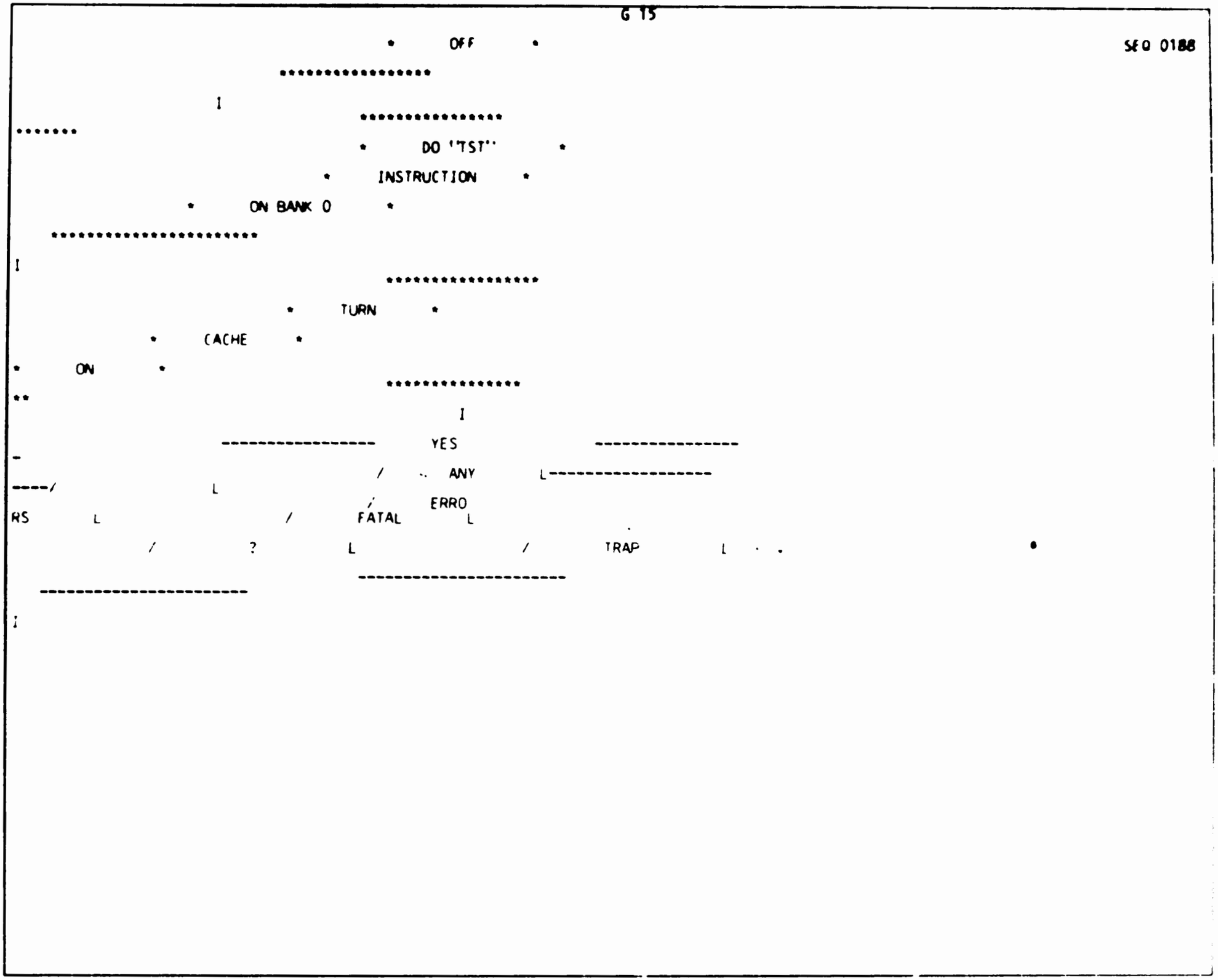

SAVE
INTER
LEAVE
CALL
GETSIZE
SELECT
1ST BANK
OF CSR
UPDATE
CONFIG
TABLE OF BANK
W/INTERLEAVE,MK11 ID

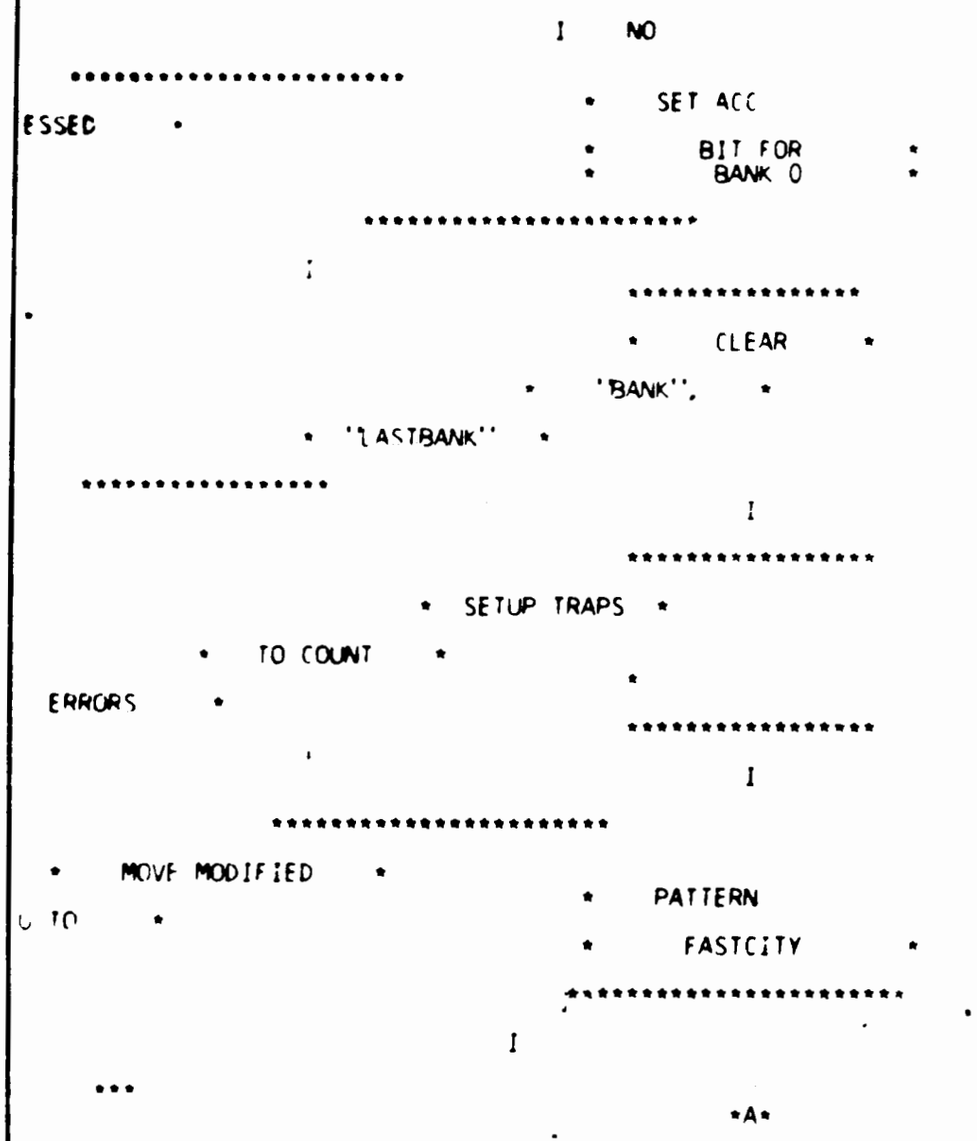

EXTERNAL
IN
TERWEAVE
NO
UPDATE CONFIG
TABLE W/BOX NO
AND CSR WORD
YES
SELECT
NEXT
BANK
BANK
YES
WITHIN CSR

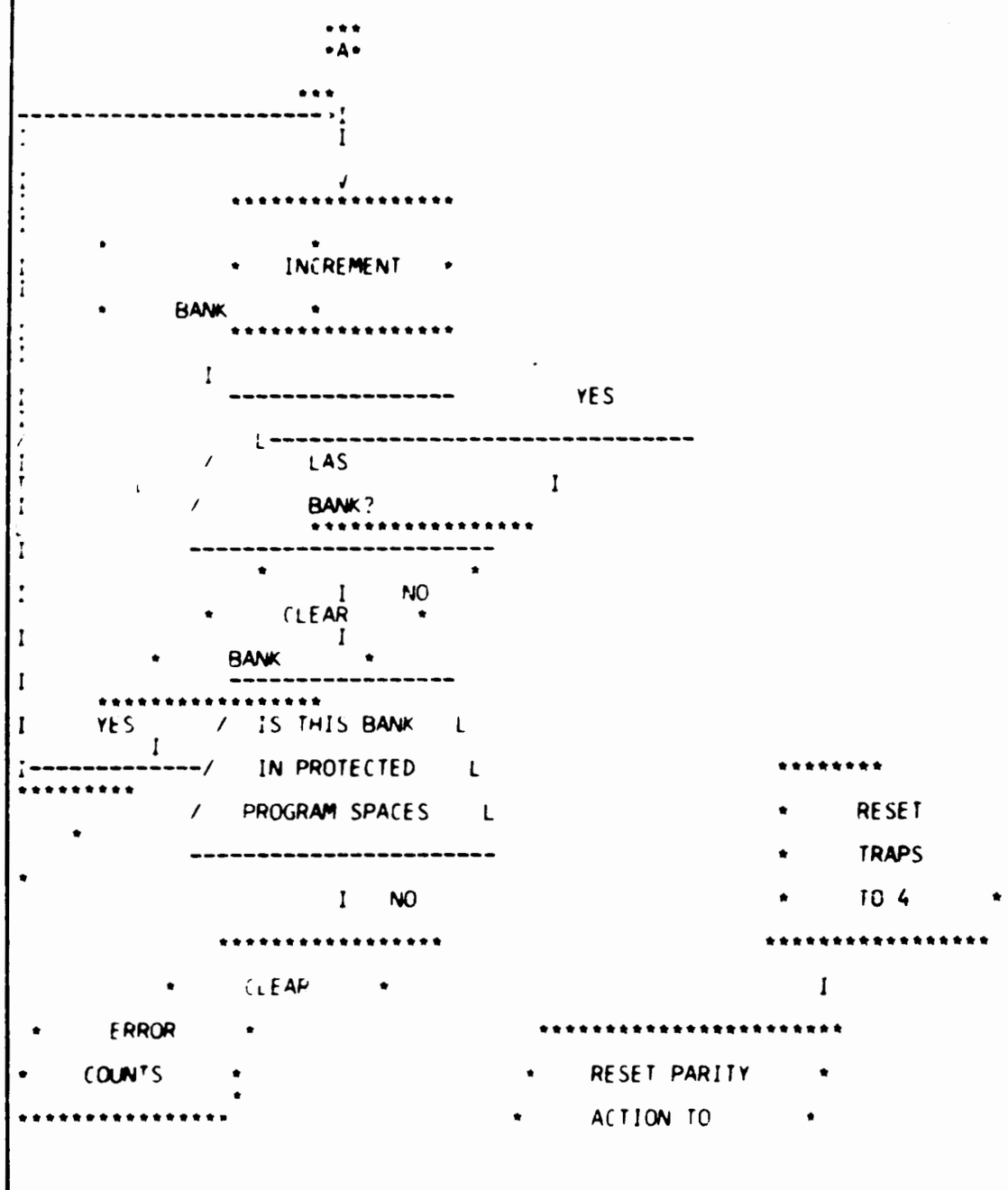

SIZE?
NO
SELECT
NEXT
CSR
LAST
NO
CS
?
YES
GO TO NEXT TEST

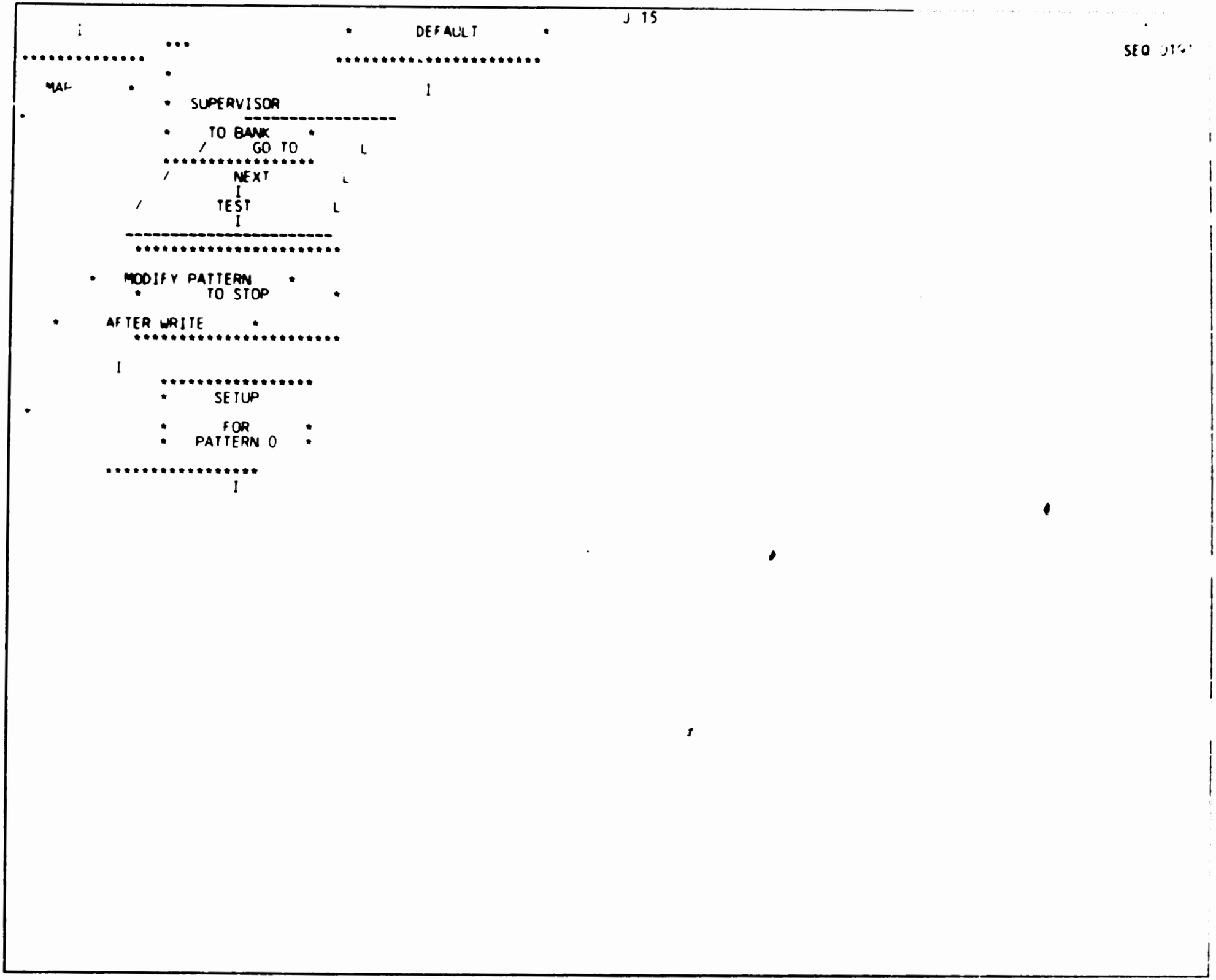
9.1.4 Size & T
est 0's & 1's On Eacn Bank -

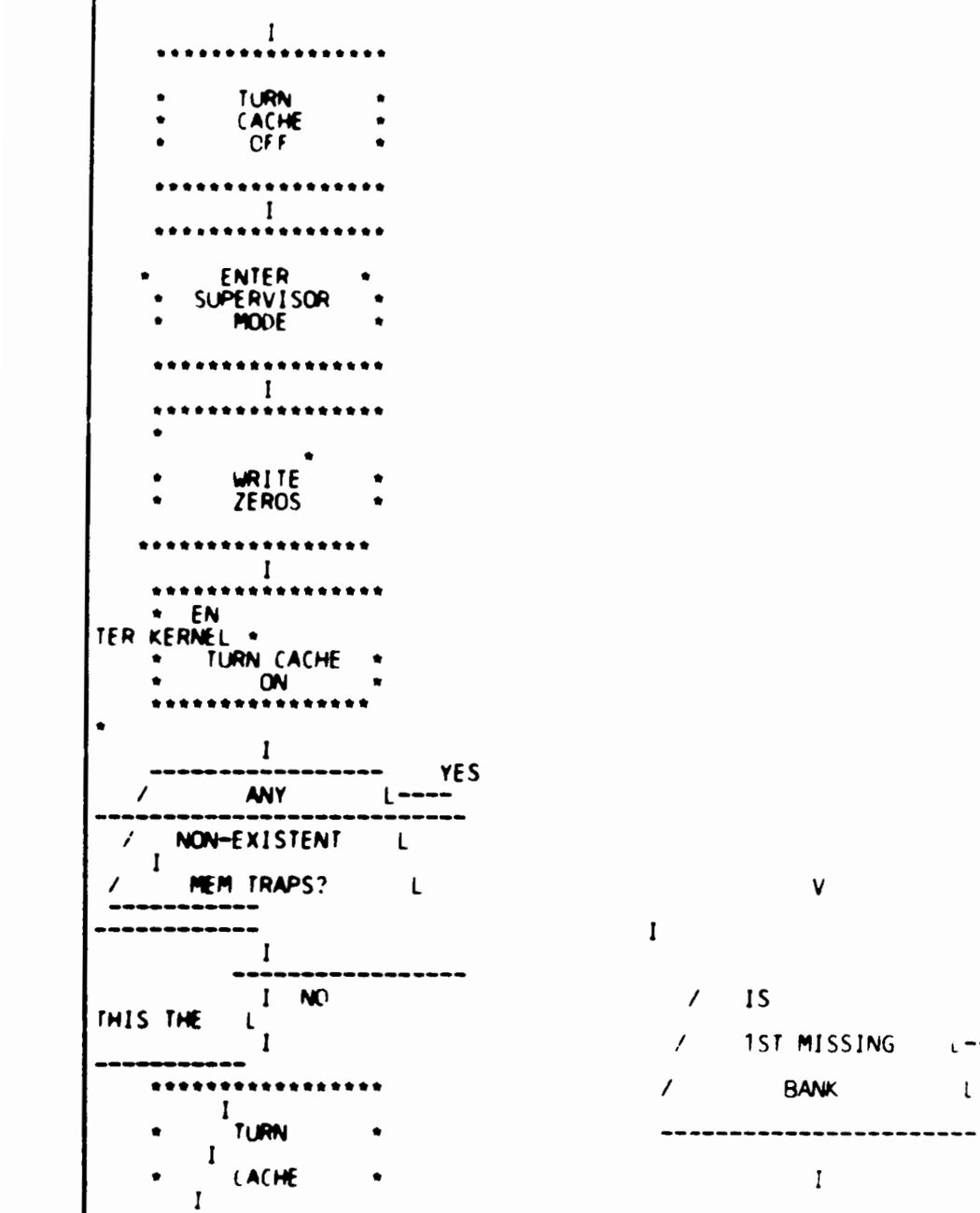


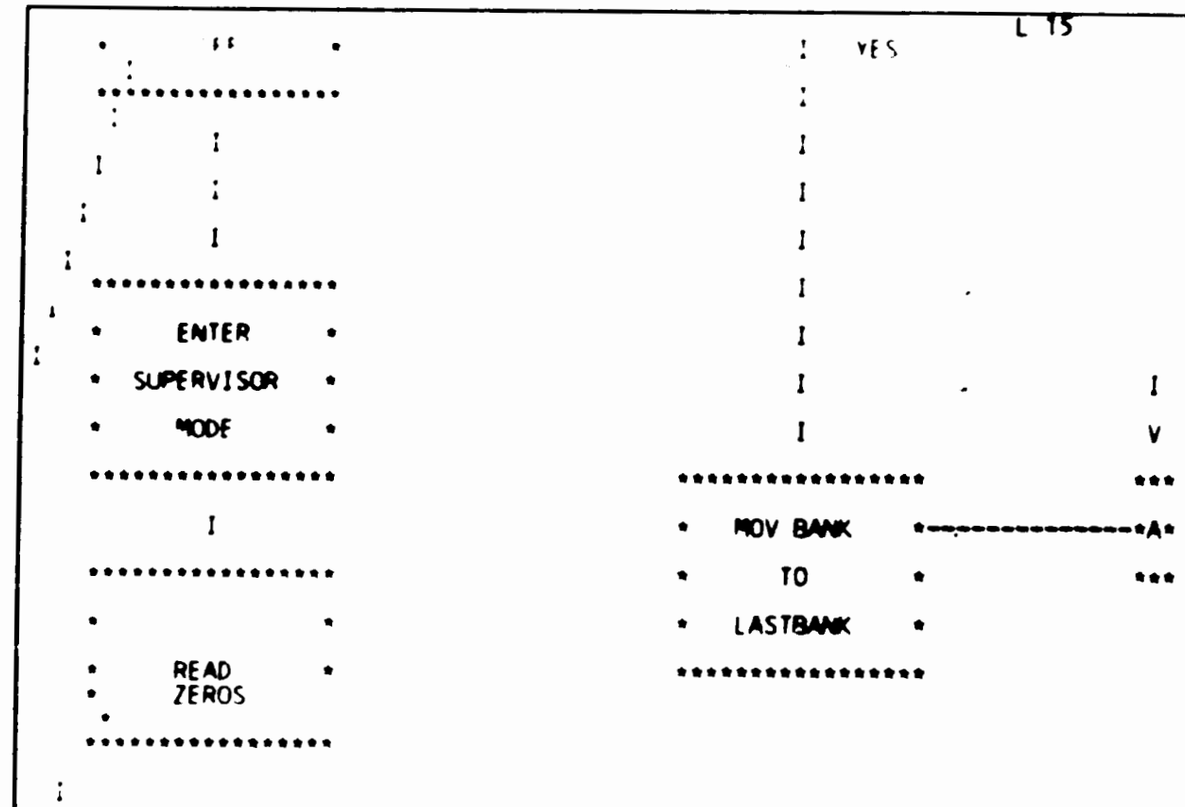

OFF
DO "TST" INSTRUCTION ON BANK 0
TURN CACHE ON
YES
ANY ERRO
FATAL
TRAP

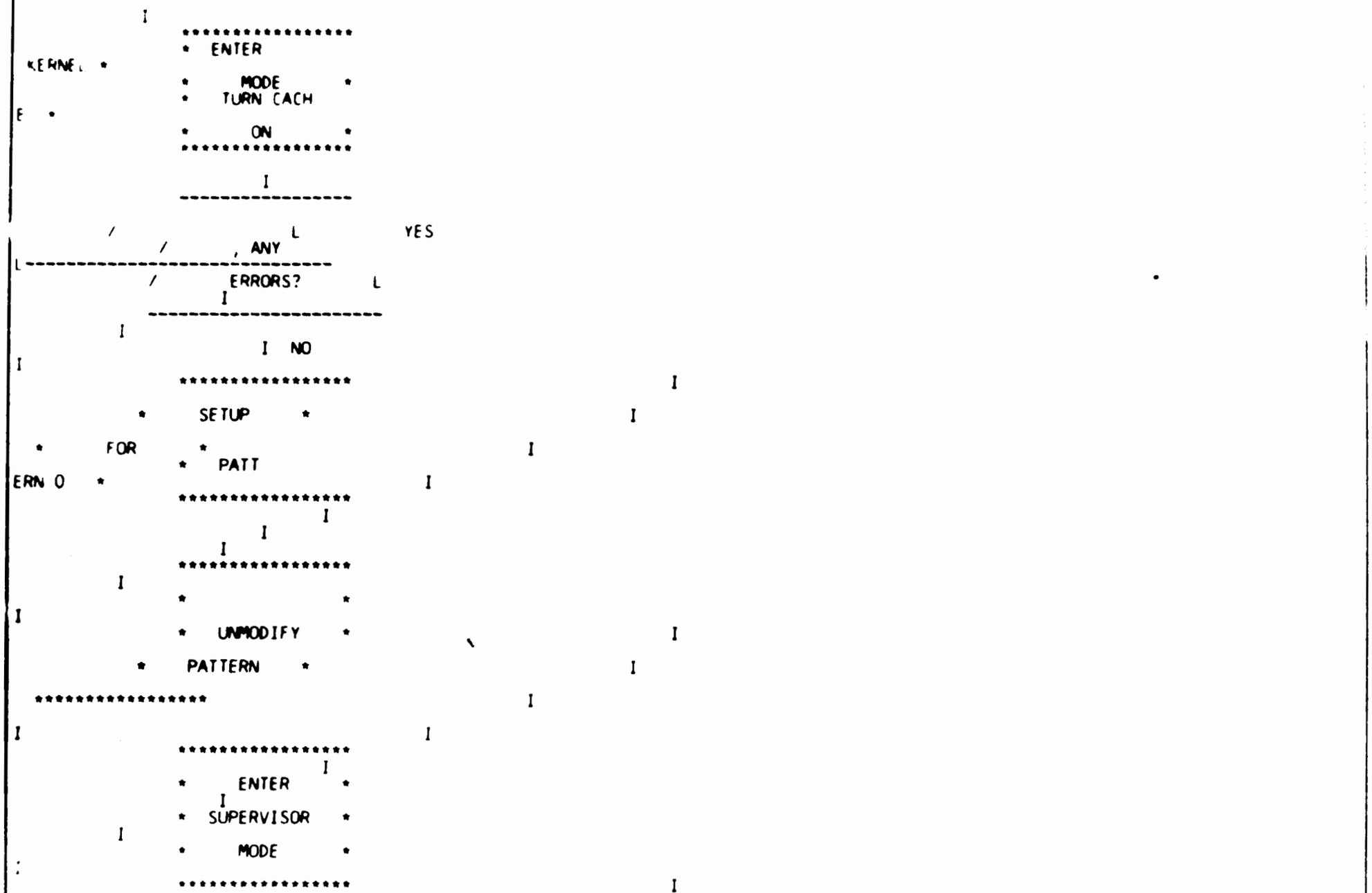

I NO
SET ACC
BIT FOR
BANK 0
CLEAR
'BANK',
'LASTBANK'
SETUP TRAPS
TO COUNT
ERRORS
MOVE MODIFIED
PATTERN
FASTCITY
A

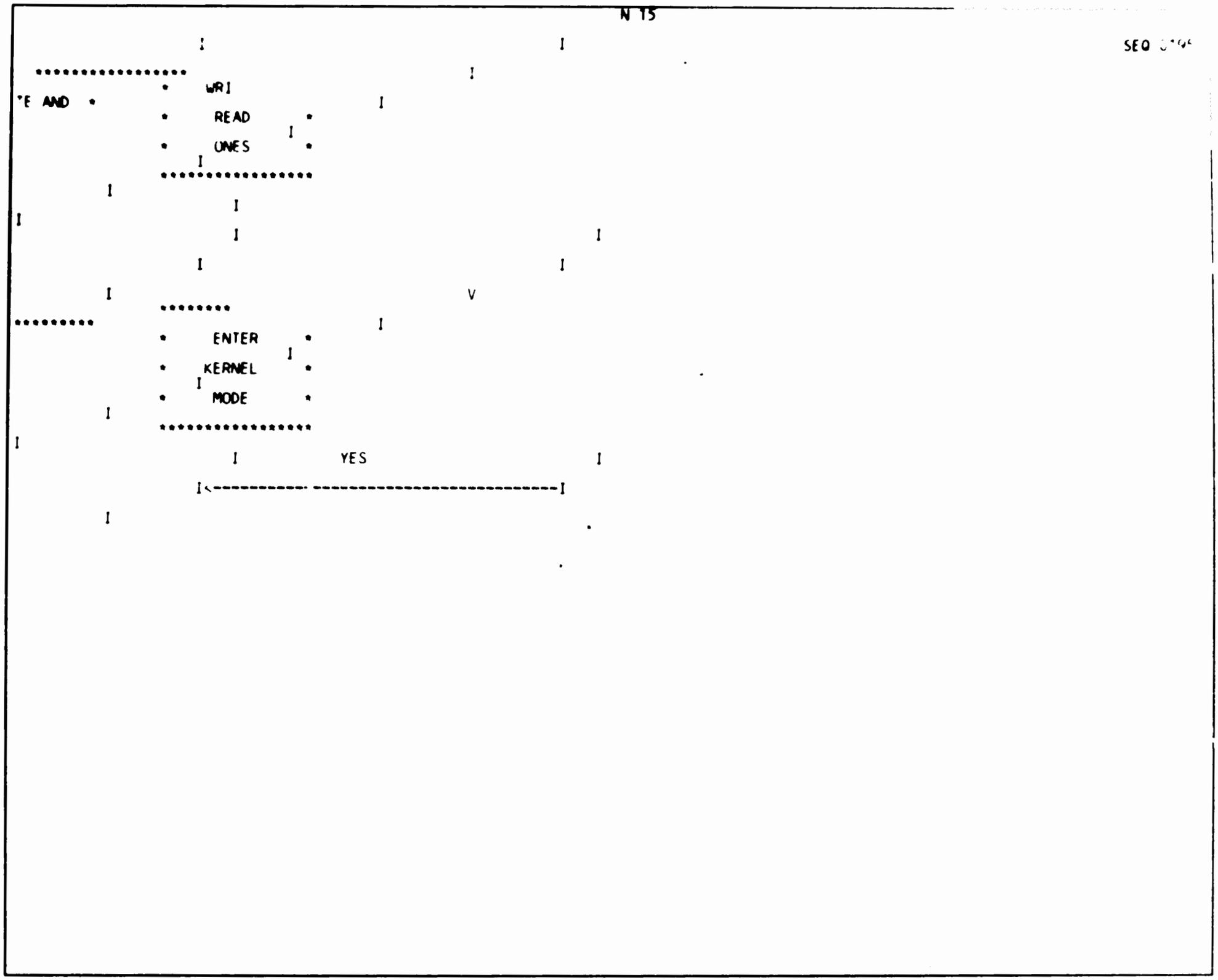

A
INCREMENT
BANK
BANK?
YES
NO
CLEAR
BANK
IS THIS BANK
IN PROTECTED
PROGRAM SPACES
NO
CLEAR
RESET
TRAPS
TO 4
ERROR
COUNTS
RESET PARITY
ACTION TO

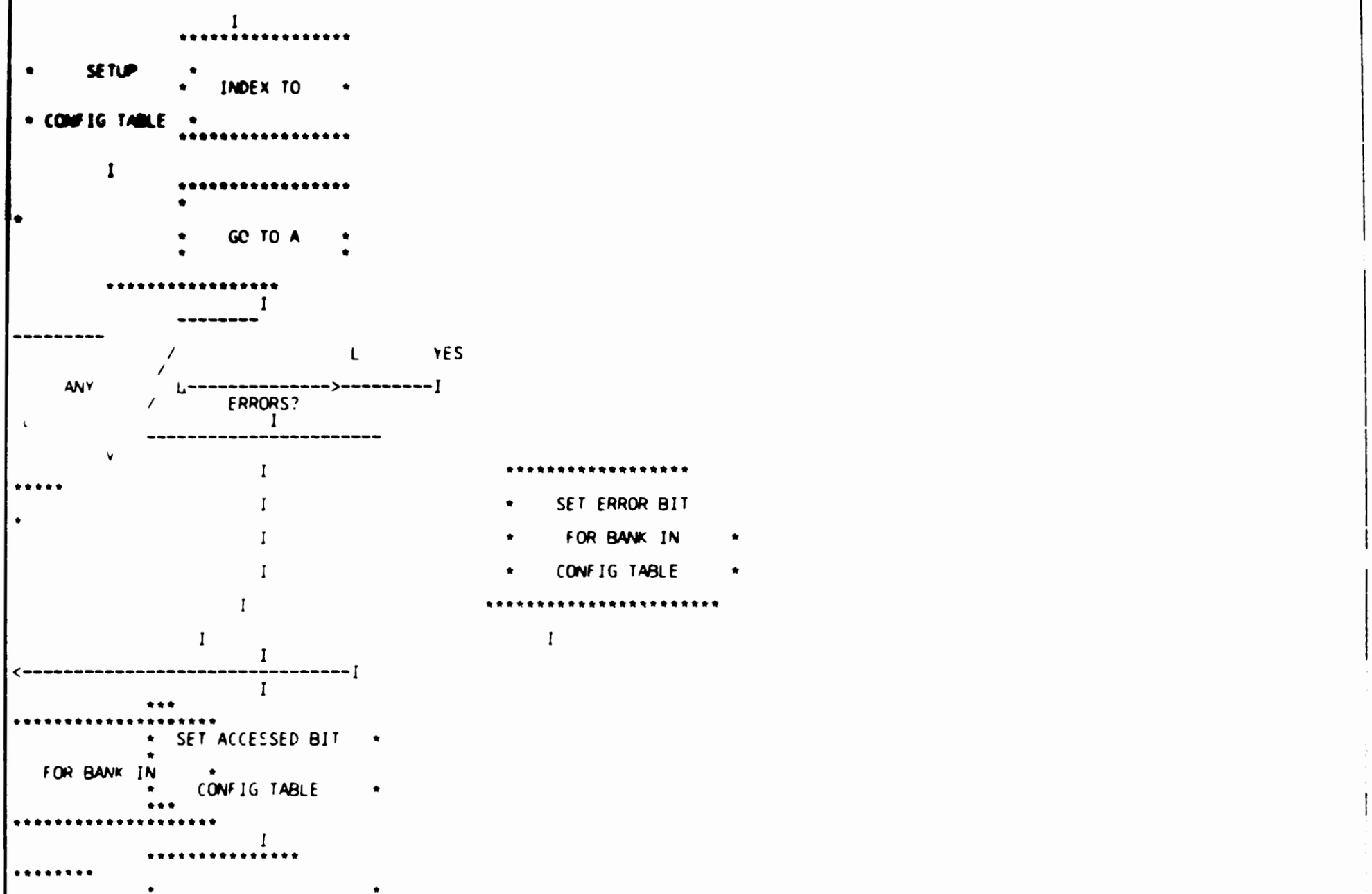

DEFAULT
SEQ
MAI
SUPERVISOR
TO BANK
GO TO
NEXT
TEST
MODIFY PATTERN
TO STOP
AFTER WRITE
SETUP
FOR
PATTERN 0


TURN CACHE OFF
ENTER SUPERVISOR MODE
WRITE ZEROS
EN TER KERNEL
TURN CACHE ON
ANY NON-EXISTENT MEM TRAPS?
YES
NO
THIS THE
TURN CACHE
IS 1ST MISSING BANK

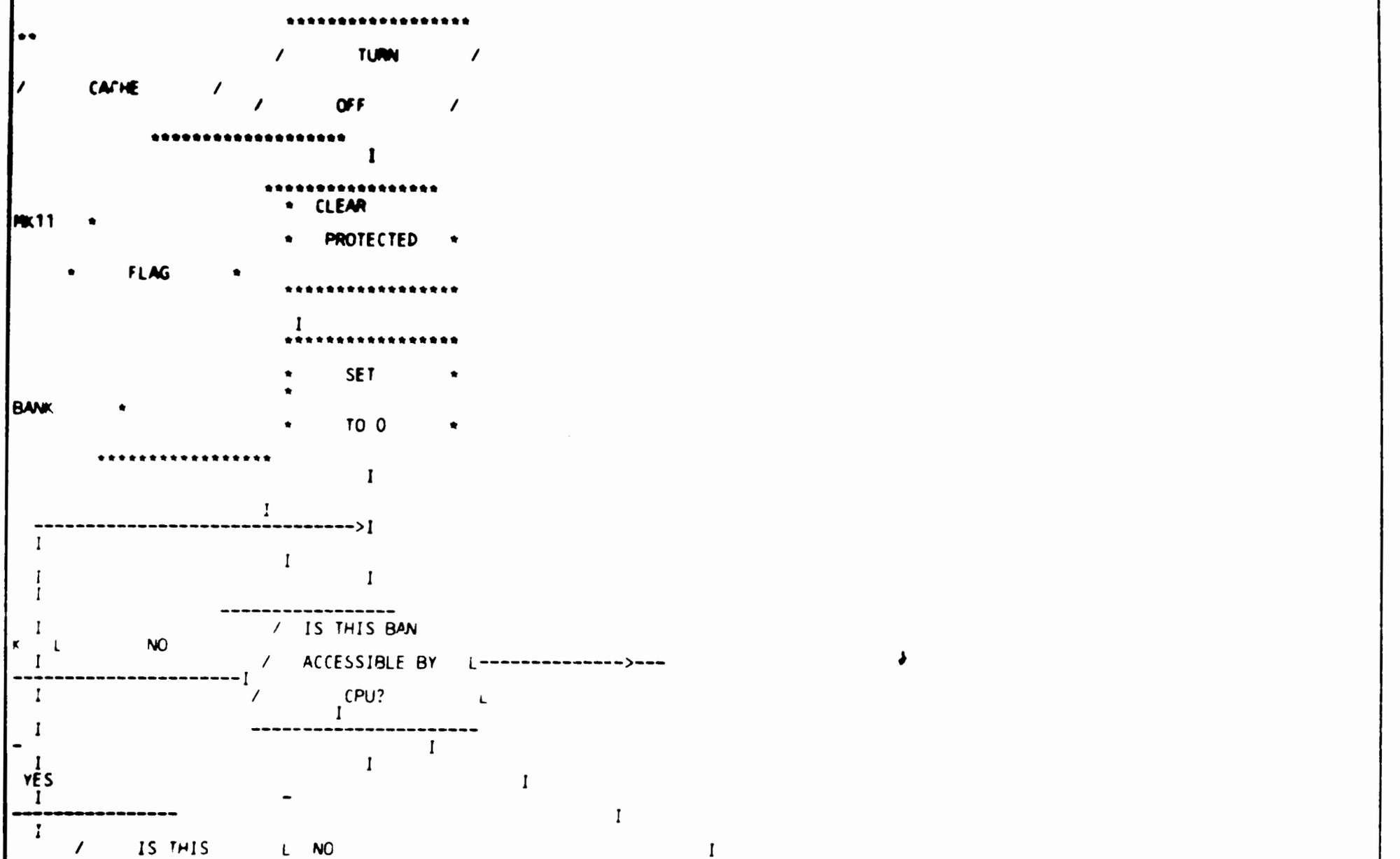

YES
ENTER SUPERVISOR MODE
READ ZEROS
MOV BANK TO LASTBANK
A


KERNEL
ENTER
MODE
TURN CACH
ON
ANY
ERRORS?
YES
NO
SETUP
FOR
PATT
ERN 0
UNMODIFY
PATTERN
ENTER
SUPERVISOR
MODE


WRI
READ
UNES
ENTER
KERNEL
MODE
YES

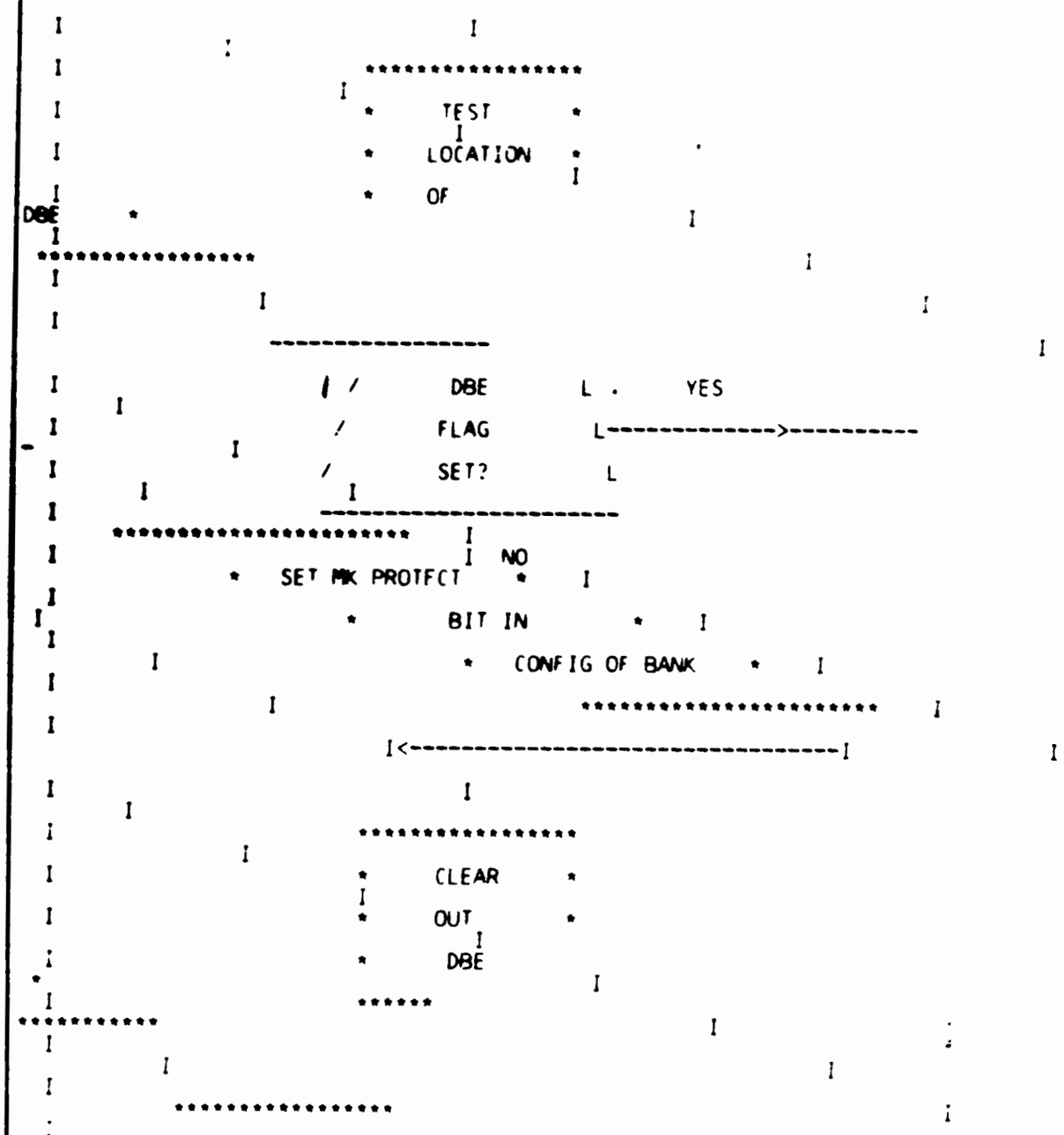

SETUP
INDEX TO
CONFIG TABLE
GO TO A
ANY
ERRORS?
YES
SET ERROR BIT
FOR BANK IN
CONFIG TABLE
SET ACCESSED BIT
FOR BANK IN
CONFIG TABLE

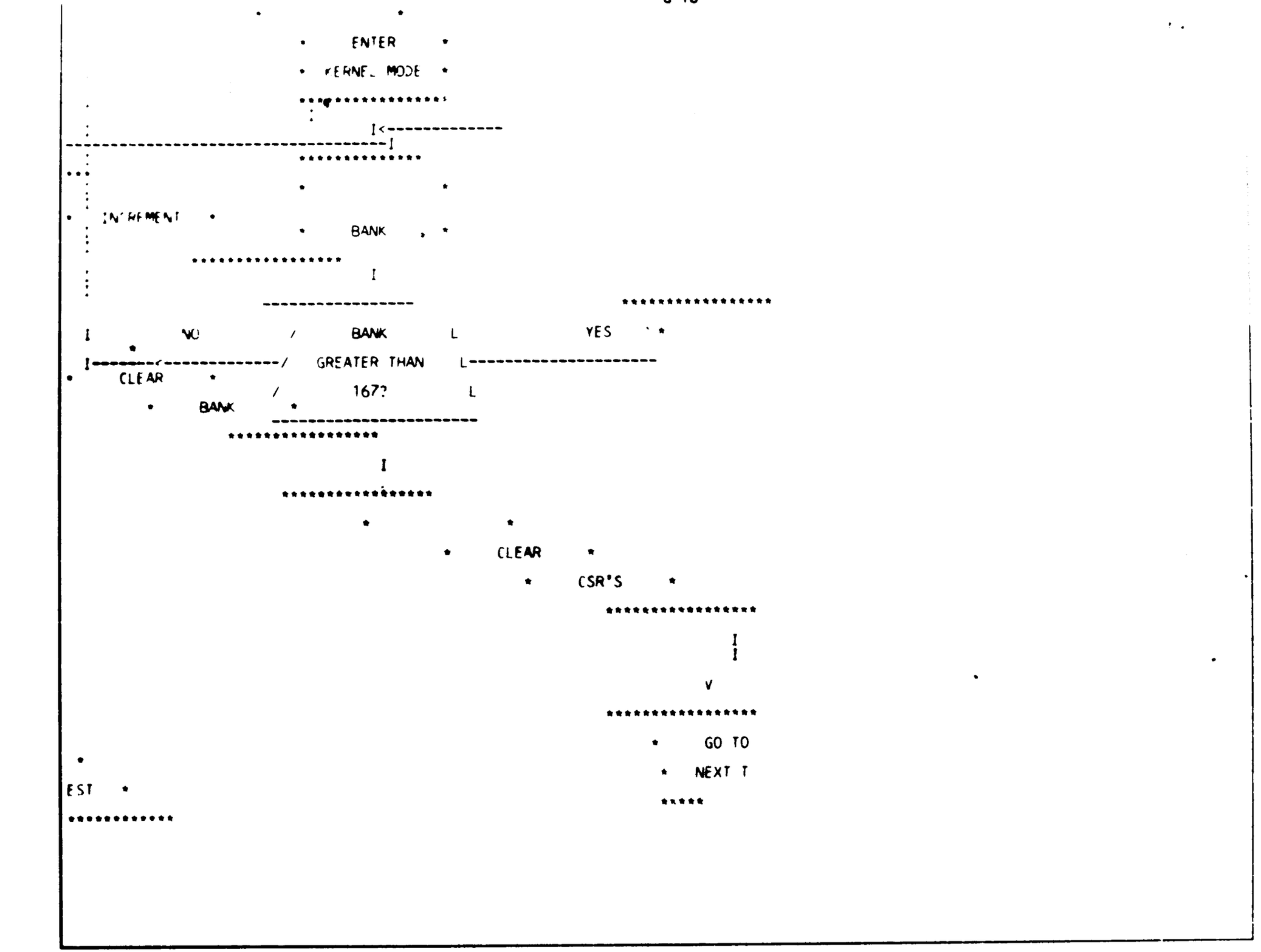
9.1.5 Determin
e Protected Banks Of MK11 -



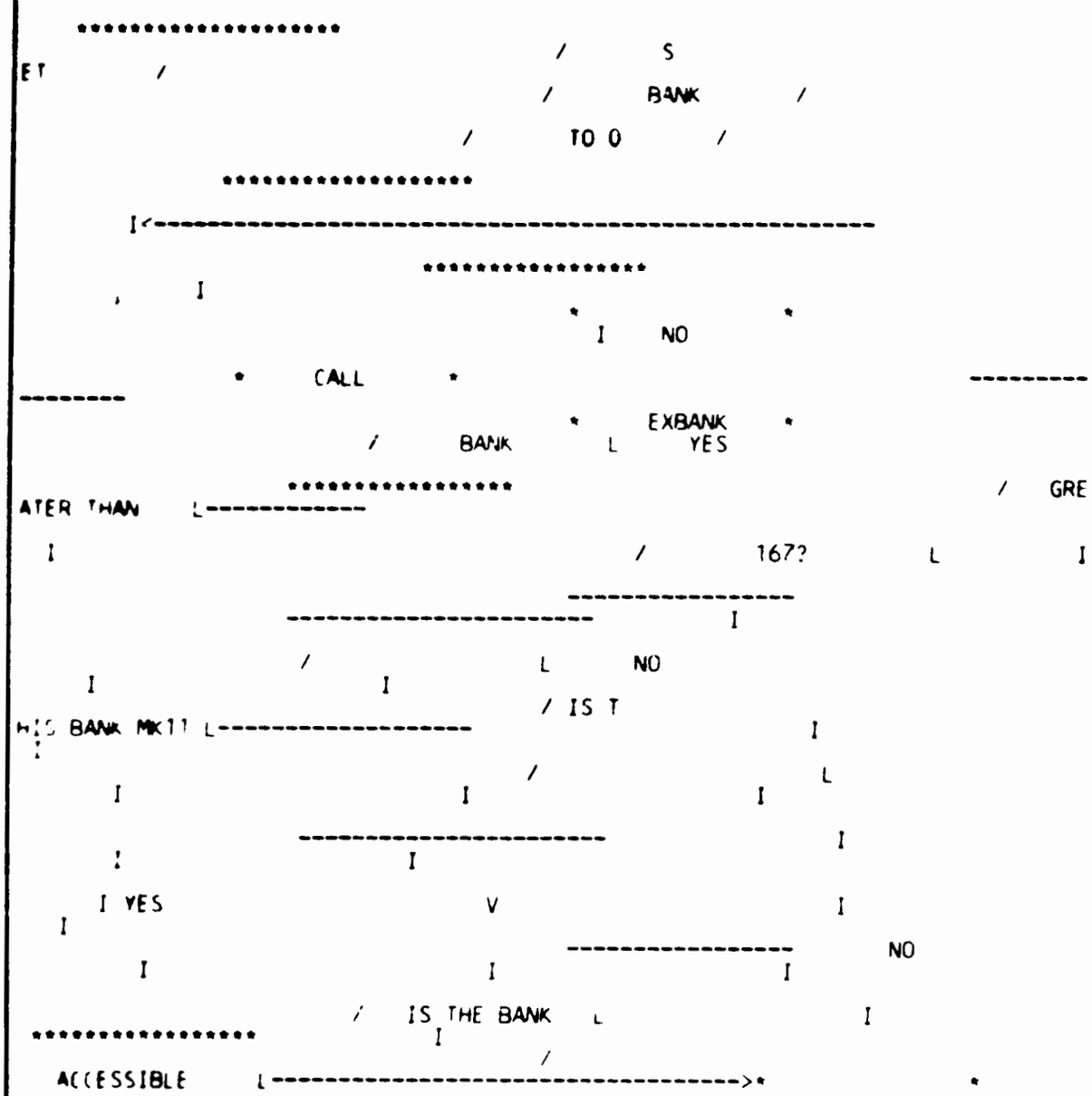

AN MK11
BANK?
YES
MAP
SUPERVIS
OR
TO BANK
ENTER
SUPERVISOR
MODE
CREATE A
DBE IN
BANK

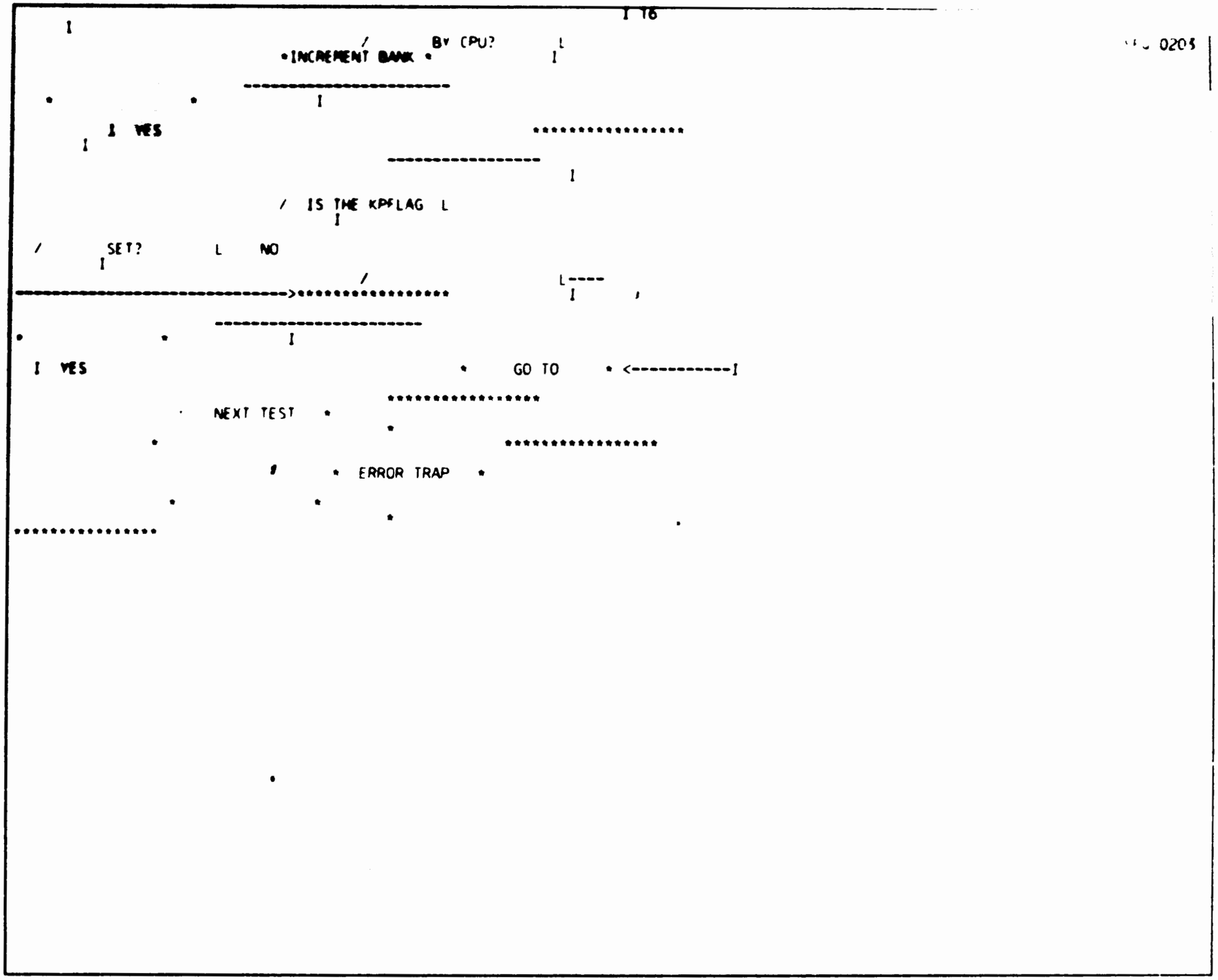
23


TEST
LOCATION
OF
DBE
DBE
FLAG
SET?
YES
NO
SET MK PROTECT
BIT IN
CONFIG OF BANK
CLEAR
OUT
DBE


ENTER
KERNEL MODE
BANK
BANK
GREATER THAN
167?
YES
CLEAR
BANK
CLEAR
CSR'S
GO TO
NEXT T

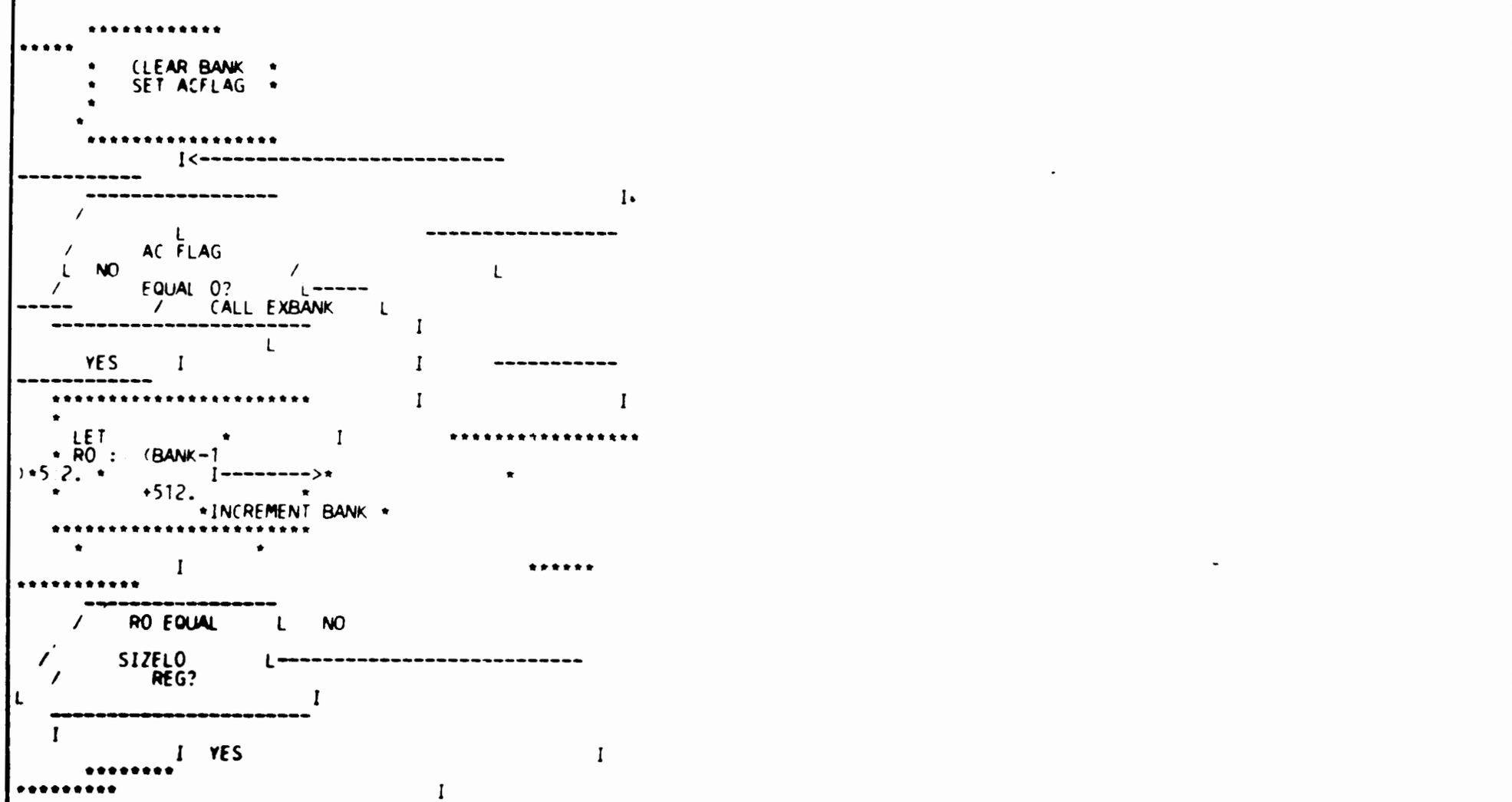
9.1
.6 Test MK11 Protection Pointer -

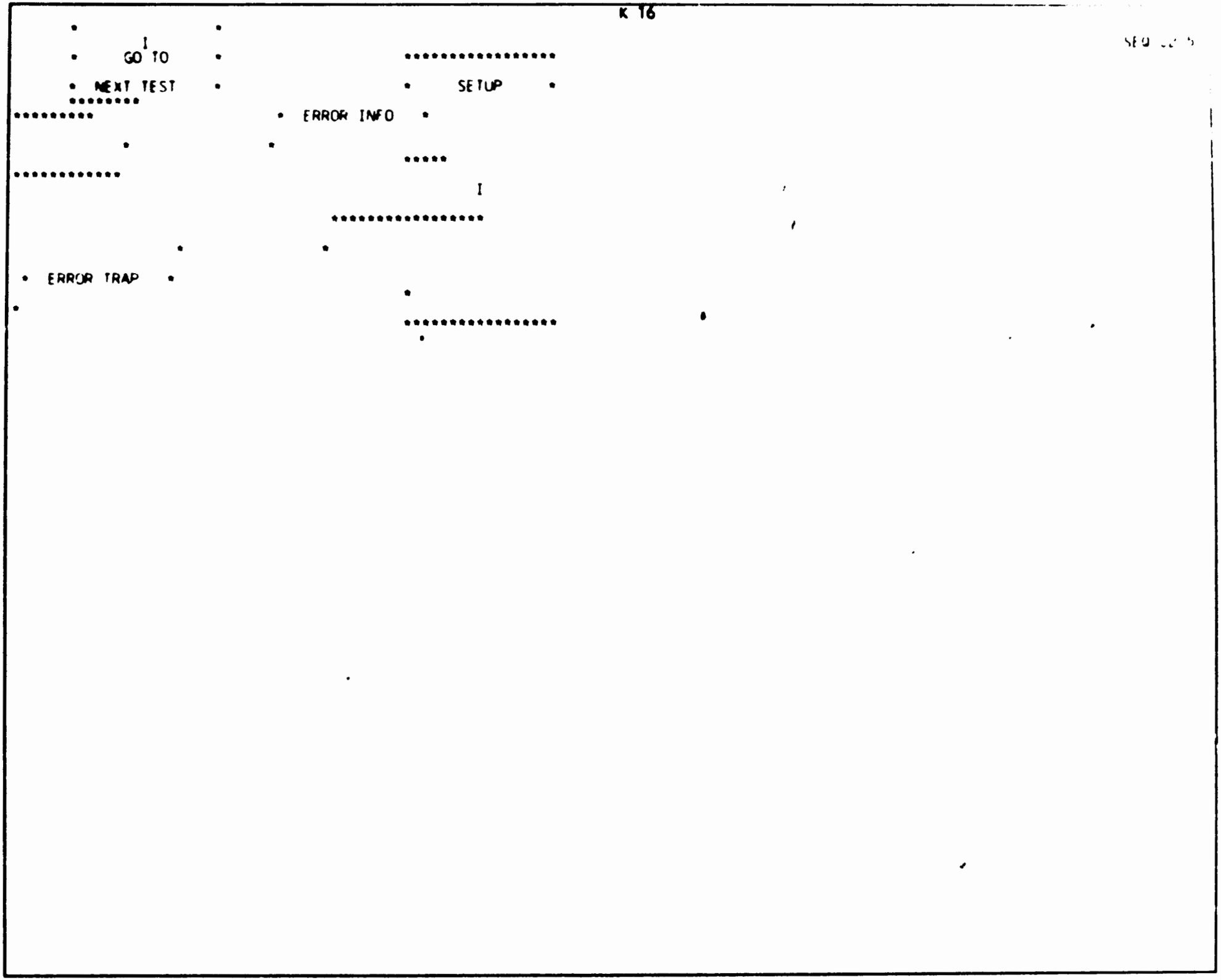



TO
BY CPU?
INCREMENT BANK
YES
IS THE KPFLAG
SET?
NO
YES
GO TO
NEXT TEST
ERROR TRAP

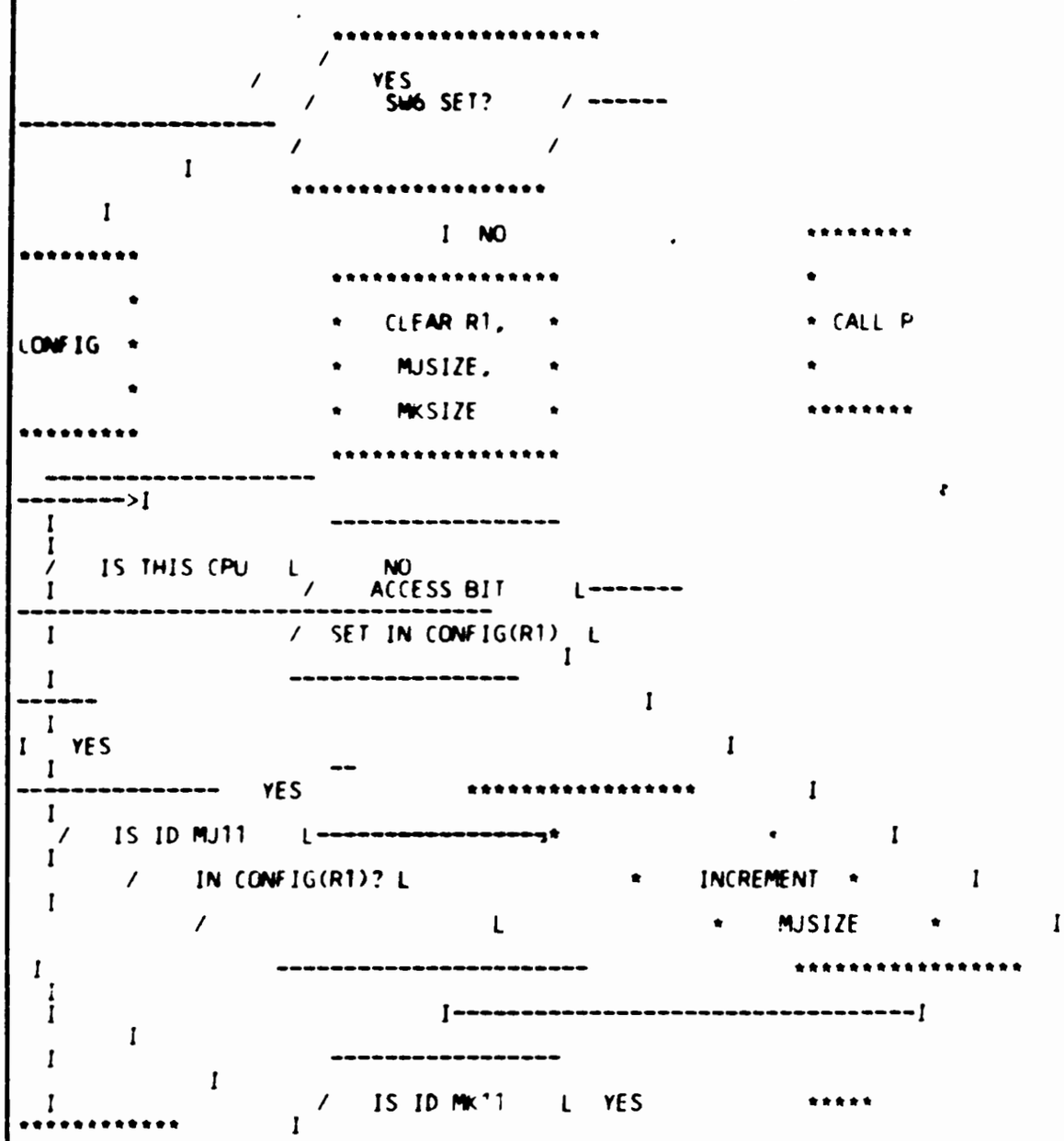
SEQ 0214

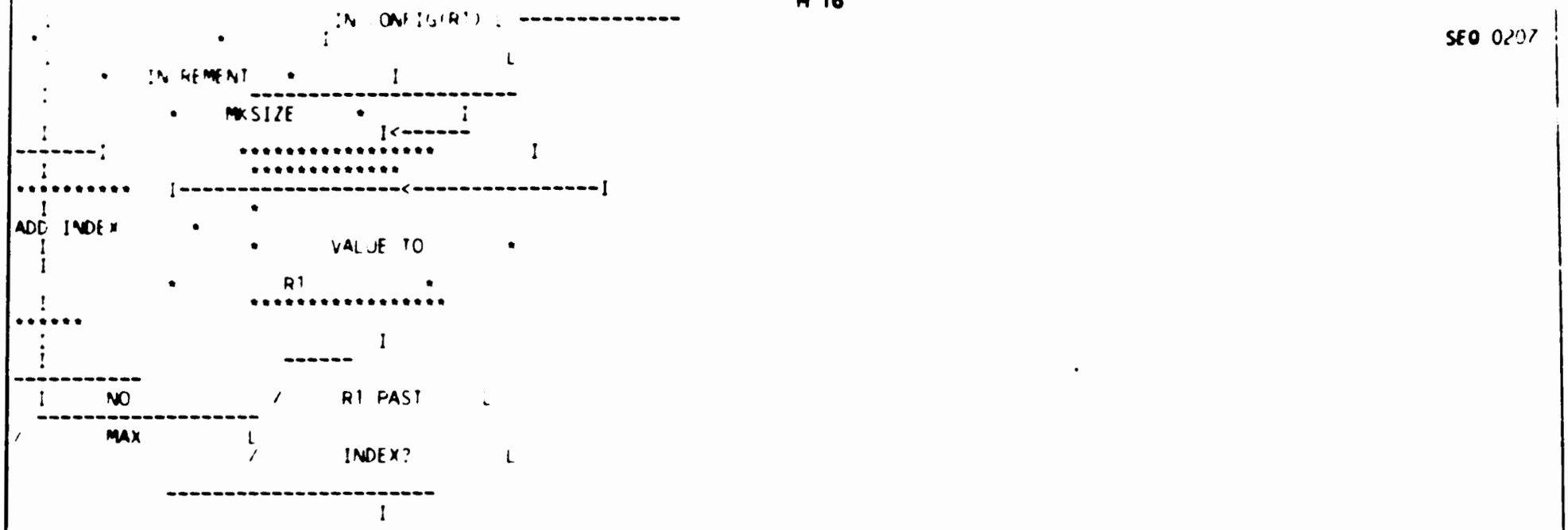
2.1.7 Test System Size Register -



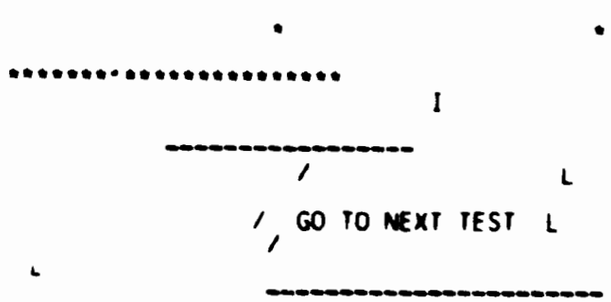

GO TO
NEXT TEST
SETUP
ERROR INFO
ERROR TRAP

9.1.8 Type Configuration -

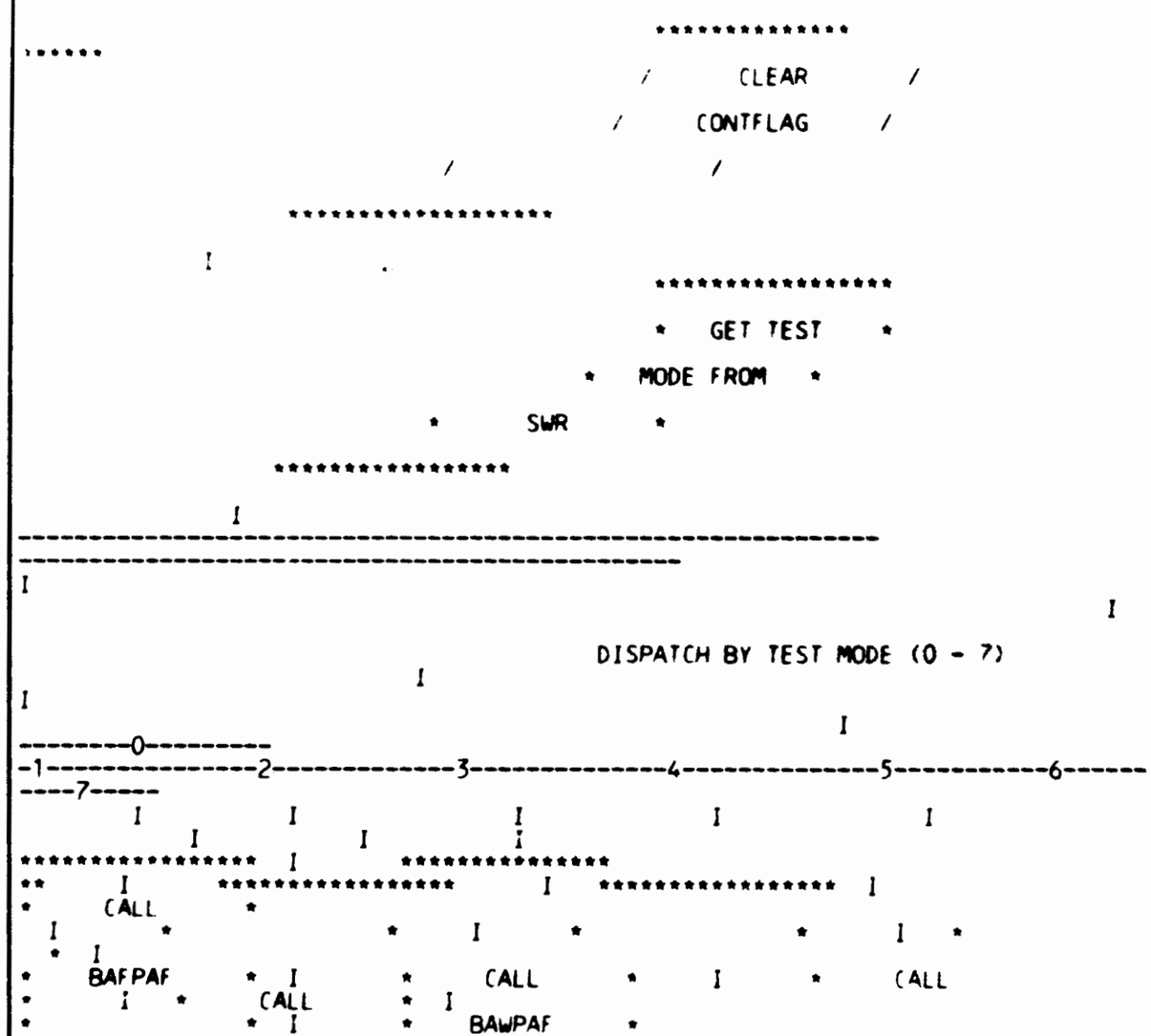


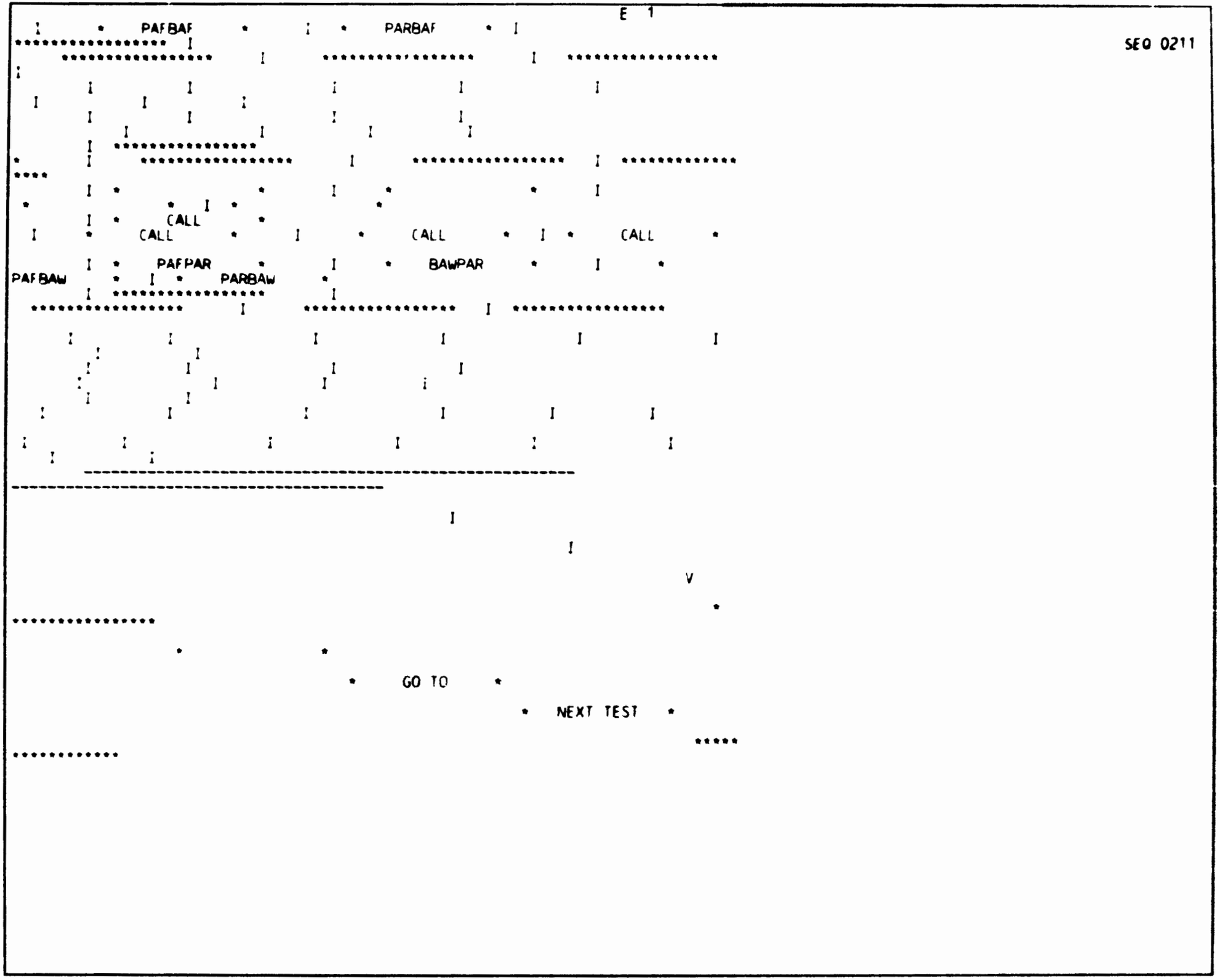

IN REMENT
MKSIZE
ADD INDEX
VALUE TO
R1
NO
MAX
R1 PAST
INDEX?


*MKSIZE:=MKSIZE *
*MJSIZE: MJSIZE * 16. *
I: MJSIZE + MKSIZE
PRINT
* I; 'K OF MEMORY'' *
PRINT
* MJSIZE;'K OF MJ11'' *
PRINT
* MKSIZE;'K OF MK1

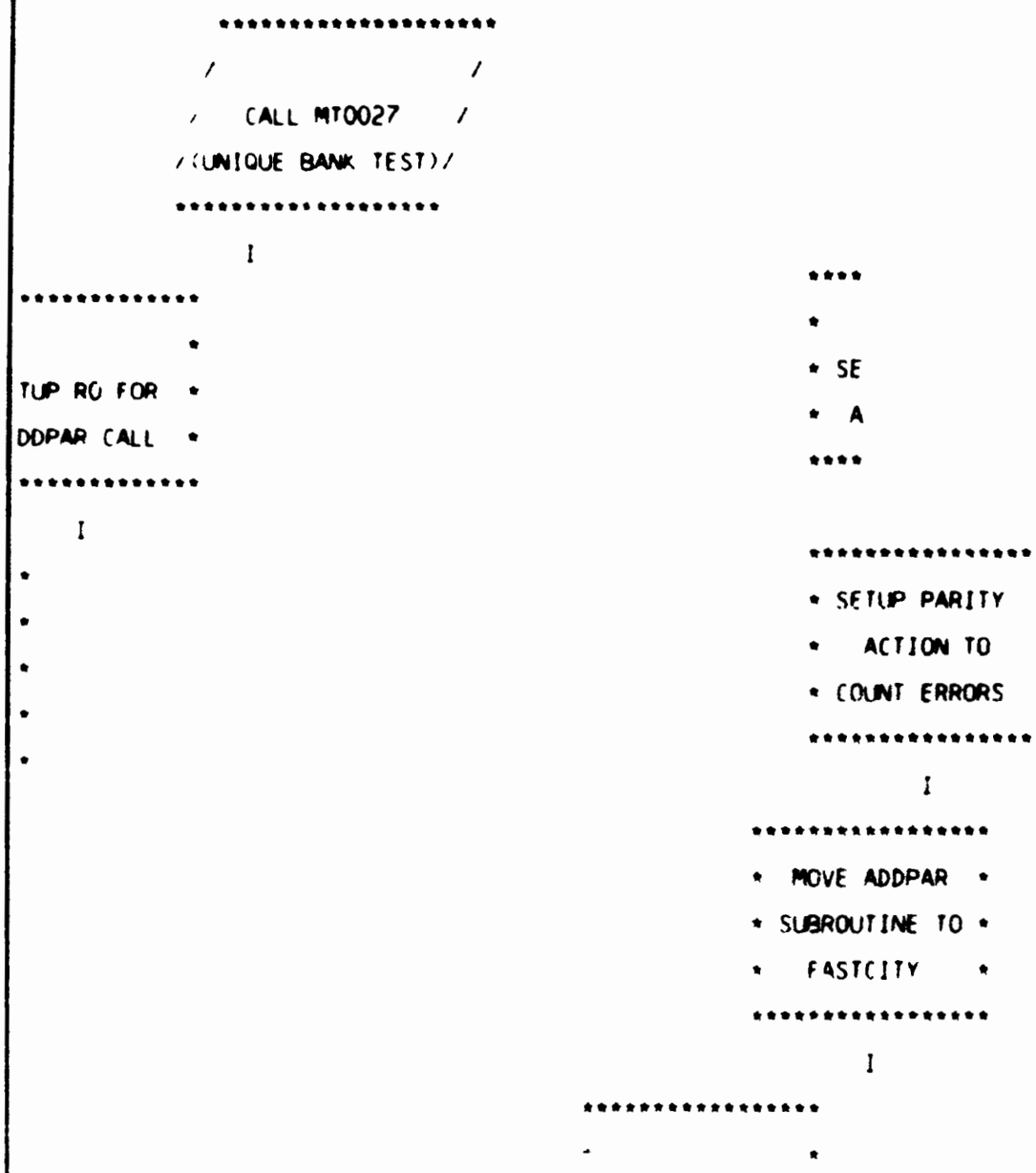

GO TO NEXT TEST

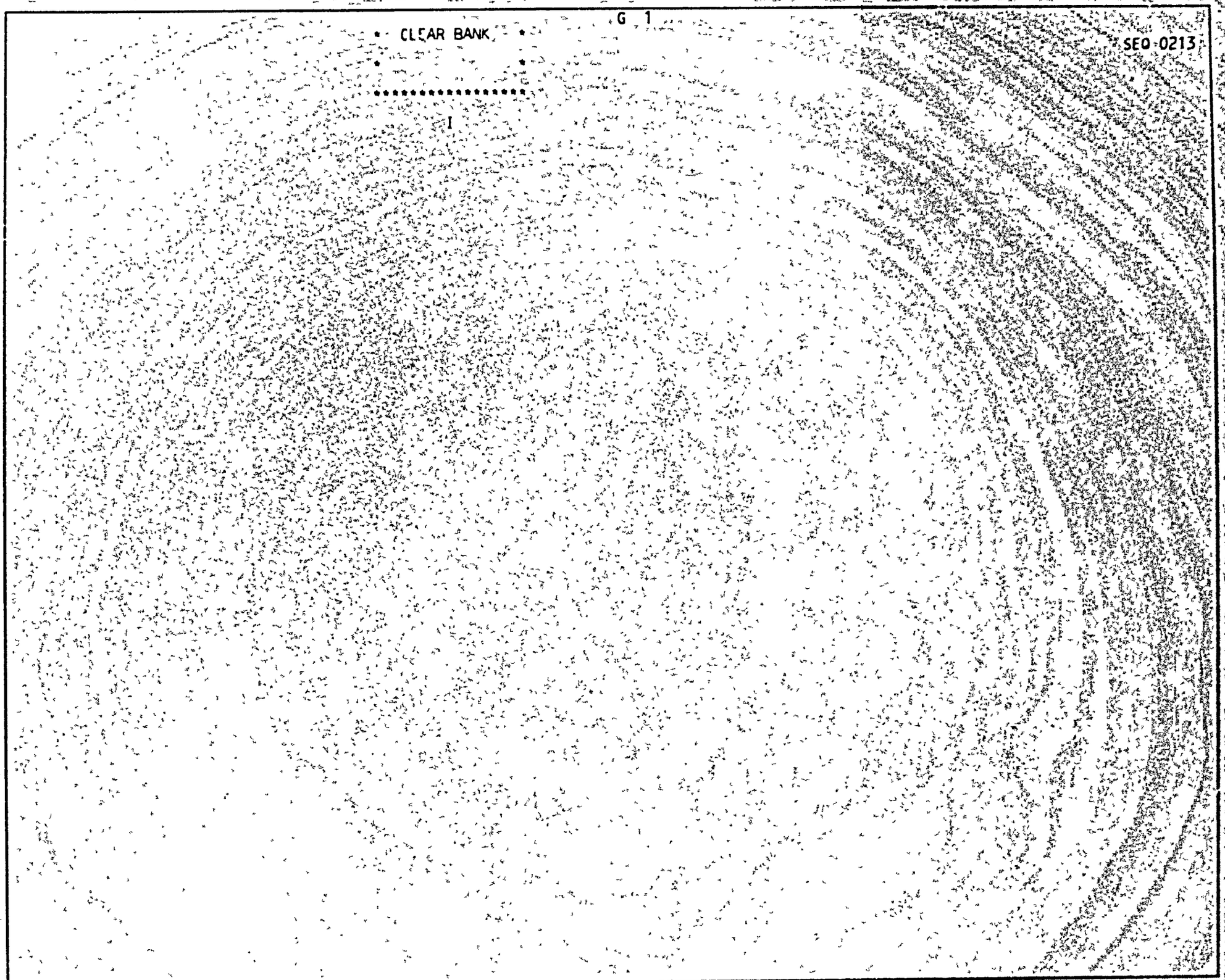
..* Run Bank eve Tests -



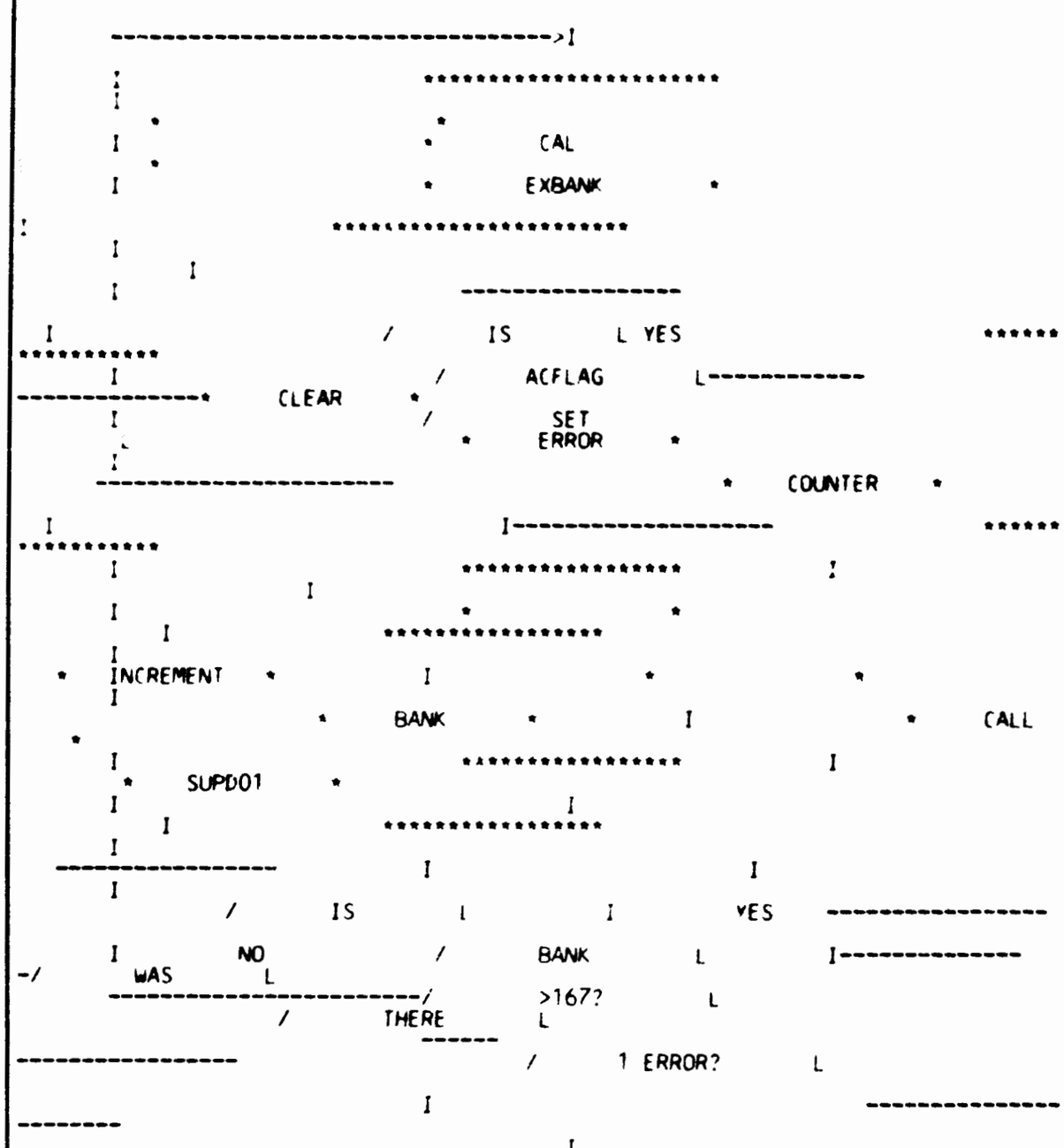

PAFBAF
PARBAF
CALL
CALL
CALL
CALL
PAFPAR
BAWPAR
PAFBAW
PARBAW
GO TO
NEXT TEST

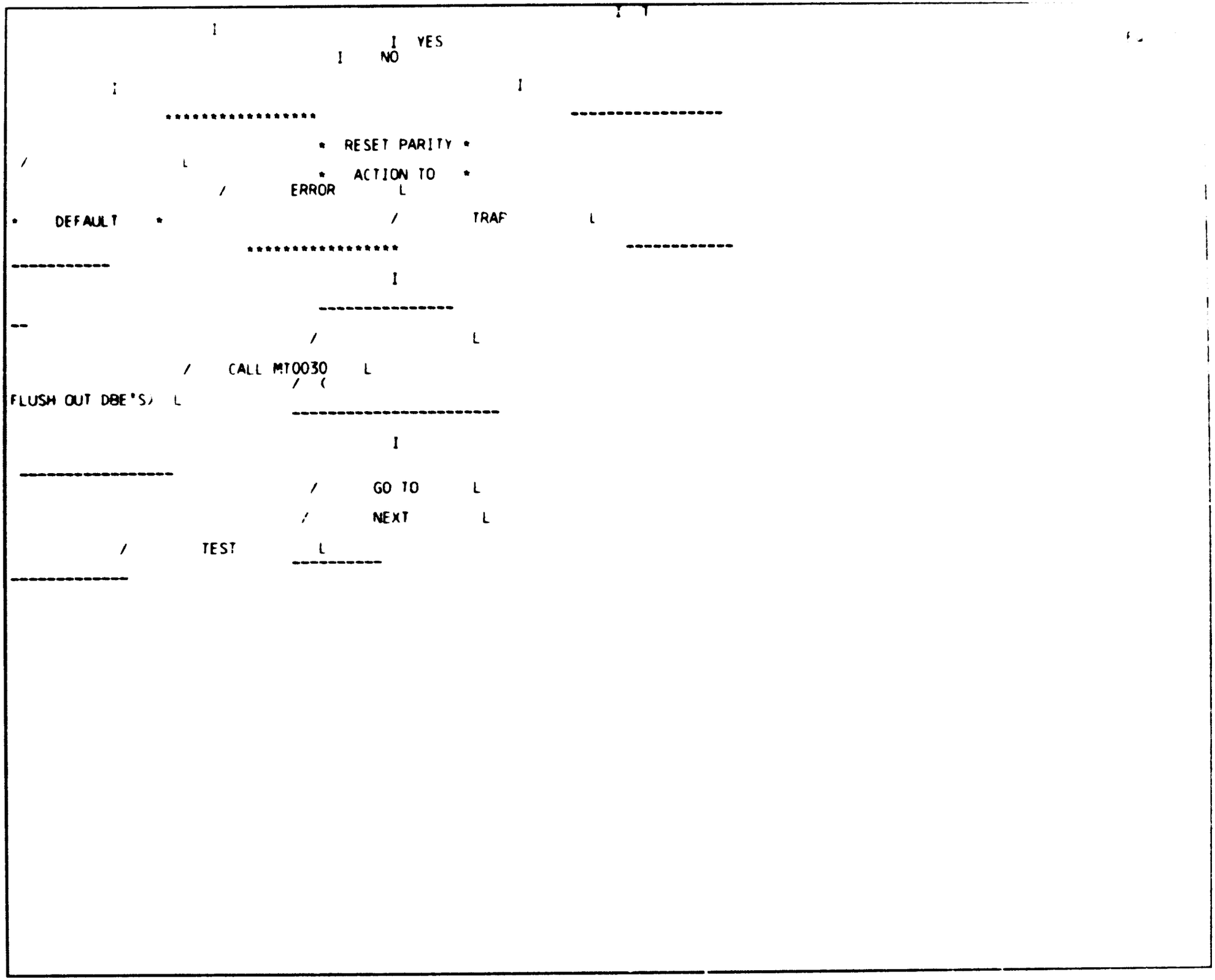
9.1.10 Run System Level Tests -



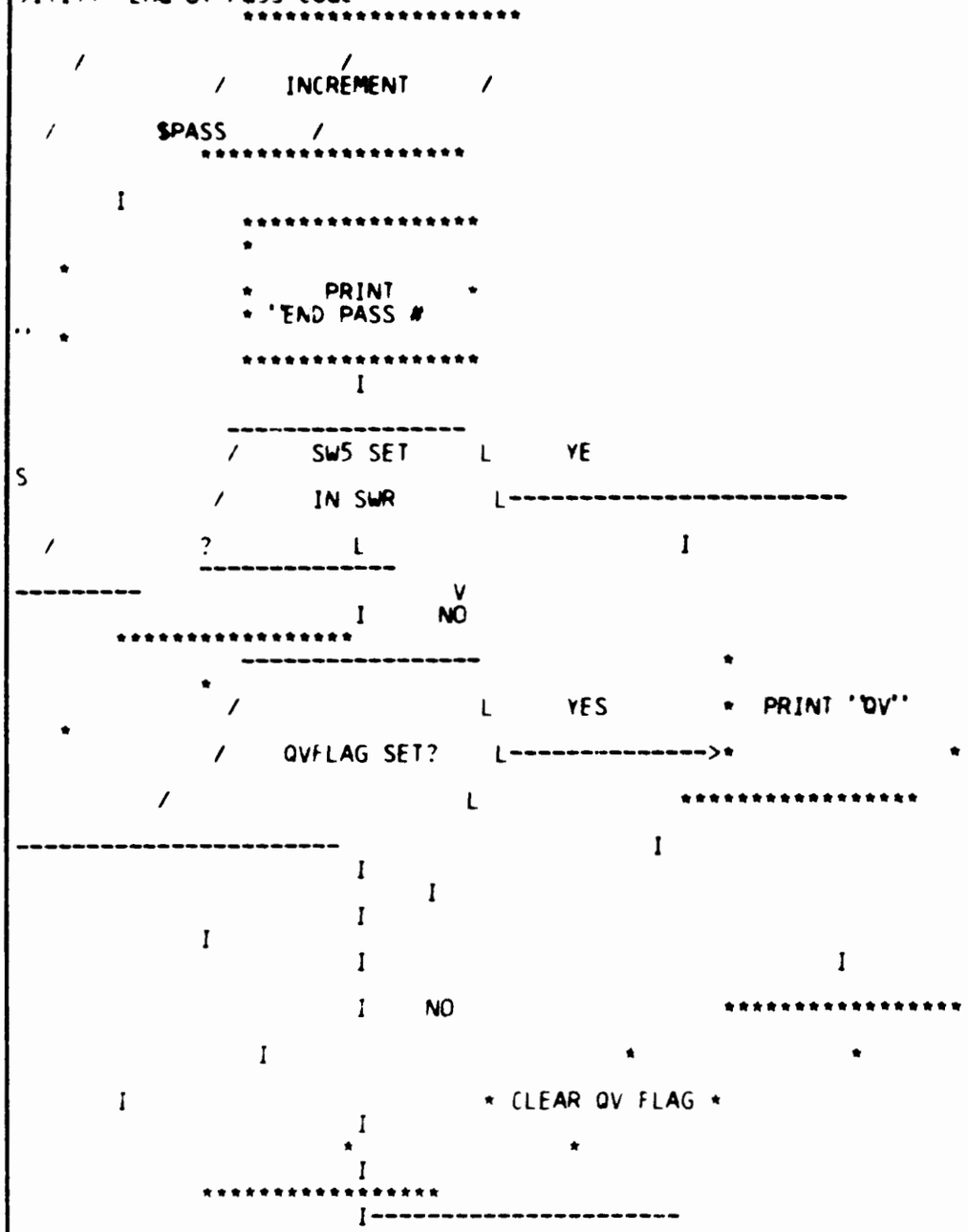

G 1
CLEAR BANK
SEO-0213

PAGE 130

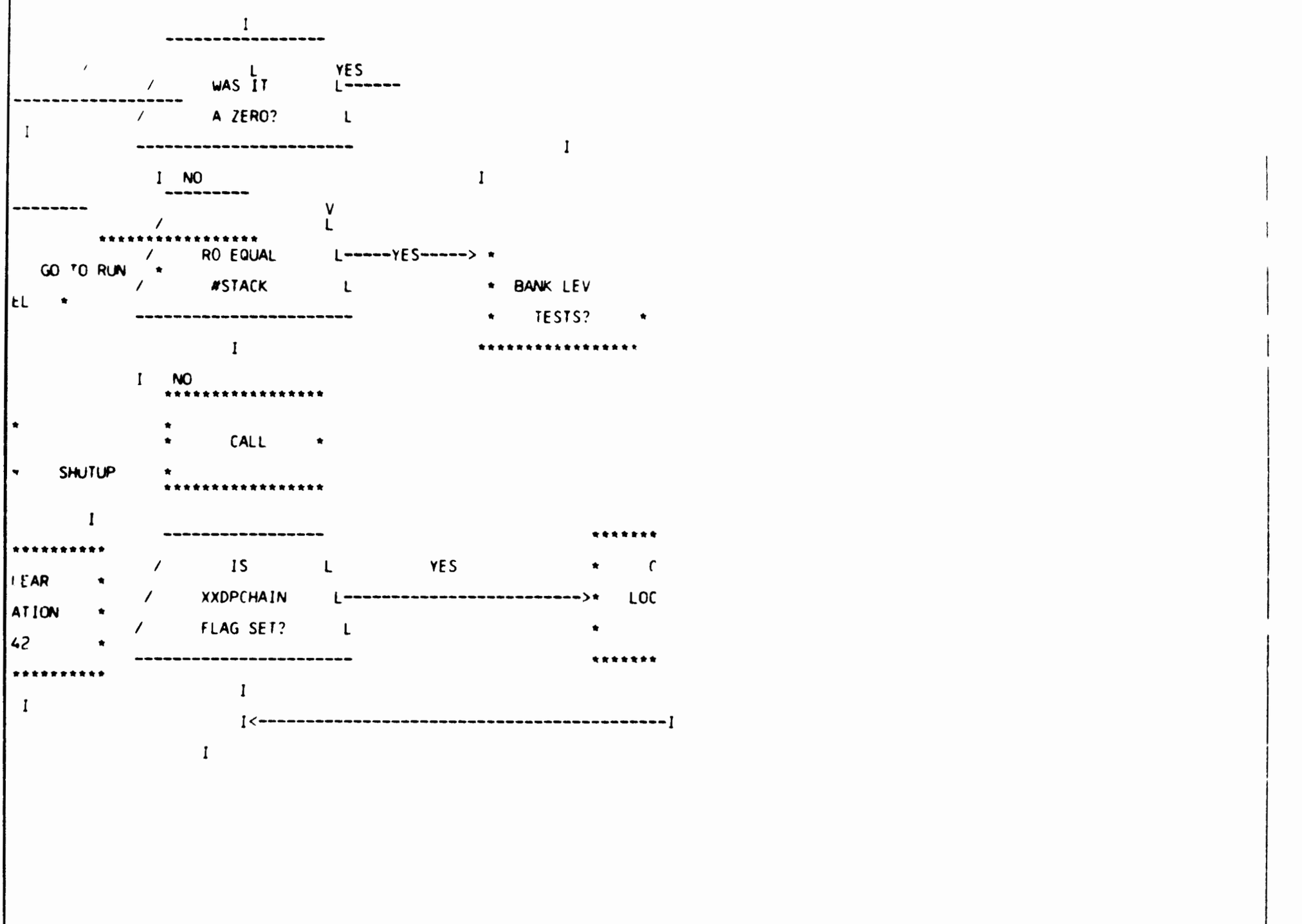

CAL
EXBANK
IS
YES
ACFLAG
CLEAR
SET
ERROR
COUNTER
INCREMENT
BANK
CALL
SUPD01
IS
YES
NO
WAS
BANK
>167?
THERE
1 ERROR?

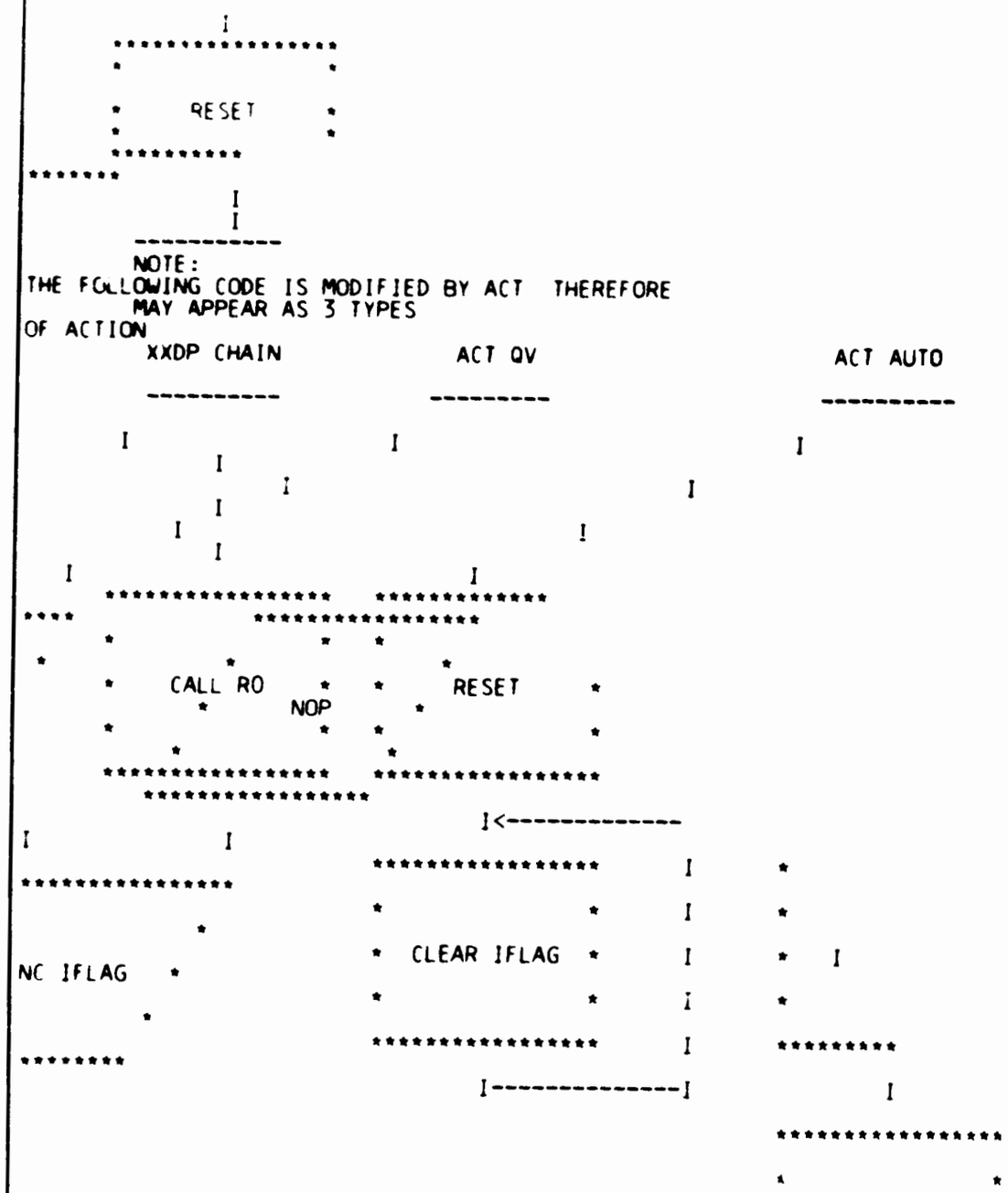

YES
NO
RESET PARITY
ACTION TO
ERROR
DEFAULT
TRAP
CALL MT0030
FLUSH OUT DBE'S
GO TO
NEXT
TEST

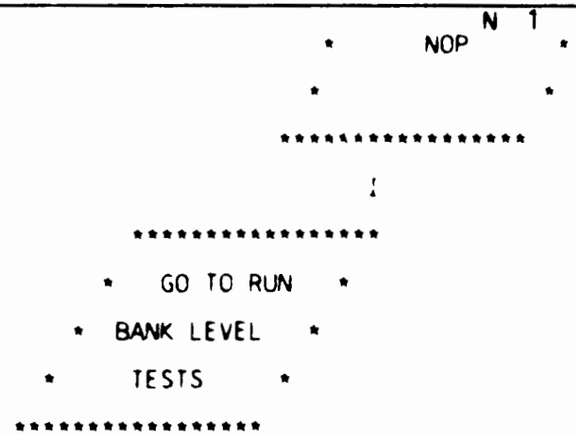
9.1.11 End Of Pass Code -




PRINT $PASS
MOVE CONTENTS
OF 42 TO R0


WAS IT A ZERO?
YES
NO
R0 EQUAL #STACK
YES
GO TO RUN
BANK LEV TESTS?
NO
CALL
SHUTUP
IS XXDPCHAIN FLAG SET?
YES
LOC
EAR
ATION
42


RESET
NOTE:
THE FOLLOWING CODE IS MODIFIED BY ACT THEREFORE
MAY APPEAR AS 3 TYPES
OF ACTION
XXDP CHAIN
ACT QV
ACT AUTO
CALL RO
NOP
RESET
CLEAR IFLAG
NC IFLAG


N 1
NOP
GO TO RUN
BANK LEVEL
TESTS

CEMKABO 1170 MAIN MEMORY DIAG 1 MACRO M1113 01-AUG-79 07:12 SEQ 0222
TABLE OF CONTENTS

(EMKABO 1170 MAIN MEMORY DIAG 1 MACRO M1113 01-AUG-79 07:12
TABLE OF CONTENTS SEQ 0223

(EMKABO 1170 MAIN MEMORY DIAG 1 MACRO M1113 01-AUG-79 07:12
TABLE OF CONTENTS

EMKABO 1170 MAIN MEMORY DIAG 1 MACRO M1113 01-AUG-79 07:12
TABLE OF CONTENTS SEQ 0225

(EMKABO 1170 MAIN MEMORY DIAG 2 MACRO M1113 01-AUG-79 07:12
TABLE OF CONTENTS SEQ 0228

```
                .TITLE  CEMKABO 1170 MAIN MEMORY DIAG 1
                .IDENT  /X01.60/
```

IDENTIFICATION

PRODUCT CODE: AC-C644B-MC

PRODUCT NAME: CEMKABO 1170 MAIN MEMORY DIAG

PRODUCT DATE: 31 JUL 1979

MAINTAINER: PRODUCT ENHANCEMENT

```
                                REVISION HISTORY
                                ================

REVISION    VERSION      DATE            AUTHOR          CHANGES
========    =======    =========      -- ==========      =======
  CEMKAA     V03.00    24-FEB-78       KAY R. FISHER    NONE - NEW PROGRAM

  CEMKAB     V09.00    9-OCT-78        KAY R. FISHER    1. ADD MULTIPROCESSOR CAPABILITIES
                                                        2. ADD SOFT ERROR TEST FOR ALPHA
                                                           PARTICLES IN MOS CHIPS
                                                        3. ADD THE FOLLOWING
                                                           FIELD SERVICE COMMANDS
                                                              A. KAMIKAZE MODE
                                                              B. CACHE ON/OFF
                                                              C. SELECT ONLY MULTIPORT TESTS
                                                              D. TEST ONLY SELECTED BANKS
                                                        4. EXPAND DETAILED ERROR REPORT
                                                           TO INCLUDE
                                                           ALL CSR'S AND SP AT TIME OF ERROR
                                                        5. SPEED UP GALLOPING PATTERN
                                                           BY EXECUTING OUT OF THE PAR'S
                                                        6. OPTIMIZE THE SHIFTING DIAGONAL
                                                           PATTERN BY SHARING CODE WITH
                                                           THE REFRESH PATTERN
                                                        7. ADD BRANCH GOBBLE PATTERN
                                                        8. ADD WRITE RECOVERY PATTERN
                                                        9. REPAIRED THE FOLLOWING BUGS
                                                              A. UNDER APT FIELD SERVICE
                                                                 COMMANDS 1 & 2
                                                              B. UNDER APT USE OF ENVIRONMENTAL
                                                                 MODE DID NOT MEET APT SPEC
                                                              C. FATAL PARITY ERRORS
                                                                 AT LOAD TIME THAT WERE
                                                                 CAUSED BY .BLKW STATEMENTS
                                                              D. RESTART AT 202 CLEARS
                                                                 ERROR ACCOUNTING
                                                              E. INTERMITTANT SINGLE BIT
                                                                 ERRORS IN CHECKBITS NOT DETECT
                                                              F. ERROR COUNT WAS MOD 32K
                                                              G. ODT HANGS AFTER 256 OPENS
                                                              H. WRONG PC PRINTED ON SOME ERROR
                                                              I. HIADRS LOADRS REG'S NOT CLEARE
                                                                 AFTER SIZING
                                                              J. ACT MEMORY SIZE DEPENDENT
                                                                 BIT DEFINED WRONG
                                                              K. UNABLE TO RUN WITHOUT
                                                                 A LINE CLOCK
```

```
                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        .SBTTL ;SWITCH REGISTER DEFINITIONS
                        .SBTTL ;*
                        .SBTTL ;*       SWITCH                  USE
                        .SBTTL ;*       ------          ---     -------------
                        .SBTTL ;*         15            AL  ON ERROR
                        .SBTTL ;*         14            LOO  ON TEST
                        .SBTTL ;*         13            INHIBIT ERROR TYPEOUTS
                        .SBTTL ;*         12            INHIBIT RELOCATION
                        .SBTTL ;*         11            QUICK VERIFY / INHIBIT MARGIN TESTING
                        .SBTTL ;*         10            BELL ON ERROR
                        .SBTTL ;*          9            LOOP ON ERROR
                        .SBTTL ;*          8            HALT PROGRAM (UNRELOCATED & RESTORE LOADERS)
                        .SBTTL ;*          7            DETAILED ERROR REPORTS
                        .SBTTL ;*          6            PRINT CONFIGURATION MAP
                        .SBTTL ;*          5            LIMIT MAX ERRORS PER BANK
                        .SBTTL ;*          4            FAT TERMINAL (132 COLUMNS OR BETTER)
                        .SBTTL ;*          3            TEST MODE - SEE DOCUMENT
                        .SBTTL ;*          2            TEST MODE - SEE DOCUMENT
                        .SBTTL ;*          1            TEST MODE - SEE DOCUMENT
                        .SBTTL ;*          0            DETECT SINGLE BIT ERRORS
```

```
    113 000000                          .ENABL  ABS
    114                                 .ENABL  AMA
    115                                 .DSABL  GBL
    116                                 ;NOTE:  CEMKAB.SML IS THE SUPER.MAC SOURCE AND IS RELEASED WITH
    117                                 ;THIS PROGRAM.  ALL THESE .MCALL STATEMENTS REFERENCE THAT FILE.
    118                                 .MCALL  SMACIT,..PUSH,..POP,..TAG,..BRAN,..EMIT,..EMITN,..EMITL,..EMITR
    119                                 .MCALL  .IFOPR,..IS,..GENBR,..OPADD,..OPSUB,CLEAR,SET,CLEARB,SETB
    120                                 .MCALL  RNE,REQ,RLT,RGE,RGT,RLE,RPL,RMI,RHI,RLOS,RHIS,RLO,RCS,RCC
    121                                 .MCALL  IF,..OR,..IFARI,..LEAVE,..GOTO,OR,AND,THEN,ELSE,WHILE,CASE
    122                                 .MCALL  FOR,TO,DOWNTO,REPEAT,UNTIL,THRU,END,BEGIN
    123                                 .MCALL  $$END,LEAVE,JUMPTO,GOTO,PUSH,POP,LET
    124                                 .MCALL  .SIMPLE,..ARITH,ORB,ANDB,IFB,UNTILB,WHILEB,ON.ERROR,ON.NOERROR
    125                                 .MCALL  $CALL,$RETURN
    126
    127                                 .NLIST  TTM                     ;I WANT FAT PAPER!
    128                                 .LIST   MC,SYM                  ;LIST MACRO CALLS, SYMBOL TABLE
    129                                 .NLIST  MD,CND,ME               ;DON'T LIST MACRO DEFS & CONDITIONALS & EXPANSIONS
    130                                 ;LST$$= 0                       ;DEFINED TO LIST SUPERMAC EXPANSIONS
    131         163000                  $SWR=   163000                  ;USE THESE SYSMAC SWITCHES
    132         000001                  $TN=    1                       ;FIRST TEST NUMBER TO ONE(1)
    133 000000                          SMACIT
```

```
                                .SBTTL  DEFINE  TRAPS
                        ;ALL ENTRIES HERE MUST HAVE A CORRESPONDING ENTRY IN THE
                        ;TRAP TABLE '$TRPAD'' (NEAR END OF PROGRAM).
                        ;*TRAP DEFINITIONS
                        ;
                        ;HERE IS HOW TRAPS WORK IN THIS PROGRAM
                        ;
                        ;ALL TRAPS EXECUTE A 'TRAP'' INSTRUCTION WHICH TAKES THE PROGRAM
                        ;TO SYMBOLIC LOCATION '$TRAP''
                        ;
                        ;AT $TRAP THE PROGRAM PICKS UP THE RIGHT BYTE OF THE TRAP INSTRUCTION
                        ;AND INDEXES INTO A TABLE AT LOCATION '$TRPAD'' WHICH SENDS THE PROGRAM TO
                        ;THE SPECIFIC ROUTINE TO HANDLE THAT SPECIFIC TRAPS TASK.
                        ;
                        ;THE ULTIMATE DESTINATION OF A TRAP INSTRUCTION CAN BE GUESSED AT AS FOLLOWS
                        ;
                        ;EXAMPLE:       NOP
                        ;               NOP
                        ;               NOP
                        ;               KERNEL                  ;ENTER KERNEL MODE
                        ;               NOP
                        ;
                        ;       ADD A DOLLAR SIGN TO THE SYMBOLIC NAME AND CHECK THE CRF FOR SOMETHING CLOSE
                        ;       IS THIS CASE THE CRF HAS $KERNE LISTED AS 032546
                        ;       AT LOCATION 32546 YOU FIND THE ROUTINE $KERNEL
                        ;
                        ;       NOTE THAT CRF SYMBOLS ARE TRUCNATED TO 6 CHARACTERS
                        ;       SYMBOLIC NAMES GREATER THAT 6 CHARACTERS ARE USED SO I CAN
                        ;       REMEMBER WHAT THEY MEAN!
                        ;
                        ;       ALL GOOD TRAP ROUTINES RETURN VIA AN 'RTI'' INSTRUCTION
104401                  TYPEIT= 104401          ;;TTY TYPEOUT ROUTINE
104402                  TYPOC=  104402          ;;TYPE OCTAL NUMBER (WITH LEADING ZEROS)
104403                  TYPOS=  104403          ;;TYPE OCTAL NUMBER (NO LEADING ZEROS)
                        ;TYPON= 104404          ;;TYPE OCTAL NUMBER (AS PER LAST CALL)
104405                  TYPDS=  104405          ;;TYPE DECIMAL NUMBER (WITH SIGN)
                        ;TYPBN= 104406          ;;TYPE BINARY (ASCII) NUMBER

104407                  GTSWR=  104407          ;;GET SOFT-SWR SETTING
104410                  CKSWR=  104410          ;;TEST FOR CHANGE IN SOFT-SWR

104411                  RDCHR=  104411          ;;TTY TYPEIN CHARACTER ROUTINE
104412                  RDLIN=  104412          ;;TTY TYPEIN STRING ROUTINE
104413                  RDOCT=  104413          ;;READ AN OCTAL NUMBER FROM TTY
104414                  RDDEC=  104414          ;;READ A DECIMAL NUMBER FROM TTY

104415                  SAVREG= 104415          ;;SAVE R0-R5 ROUTINE
104416                  RESREG= 104416          ;;RESTORE R0-R5 ROUTINE

104417                  KERNEL= 104417          ;ENTER KERNEL MODE

104420                  ENERGIZE=104420         ;TURN ON MEMORY MANAGEMENT & TRAPS
104421                  DEENERGIZE=104421       ;TURN OFF MEMORY MANAGEMENT & TRAPS

104422                  KMAP-   104422          ;MAP KERNEL 1 TO 1

104423                  CACHON= 104423          ;TURN ON CACHE
```

```
193          104424                  CACHOFF=104424          ;TURN OFF CACHE
194
195          104425                  LOADCSR=104425          ;LOAD CORRECT CSR
196          104426                  READCSR=104426          ;READ CORRECT CSR
197
198          104427                  PERR01= 104427          ;PROGRAM DETECTED ERROR
199          104430                  PERR02= 104430          ;PROGRAM DETECTED ERROR
200          104431                  PERR03= 104431          ;PROGRAM DETECTED ERROR
201          104432                  PERR04= 104432          ;PROGRAM DETECTED ERROR
202          104433                  PERR07= 104433          ;PROGRAM DETECTED ERROR
203          104434                  PERR10= 104434          ;PROGRAM DETECTED ERROR
204          104435                  PERR11= 104435          ;PROGRAM DETECTED ERROR
205          104436                  PERR12= 104436          ;PROGRAM DETECTED ERROR
206          104437                  PERR13= 104437          ;PROGRAM DETECTED ERROR
207          104440                  PERR14= 104440          ;PROGRAM DETECTED ERROR
208          104441                  PERR15= 104441          ;PROGRAM DETECTED ERROR
209          104442                  PERR16= 104442          ;PROGRAM DETECTED ERROR
210          104443                  PERR17= 104443          ;PROGRAM DETECTED ERROR
211          104444                  PERR20= 104444          ;PROGRAM DETECTED ERROR
212          104445                  PERR21= 104445          ;PROGRAM DETECTED ERROR
213          104446                  PERR22= 104446          ;PROGRAM DETECTED ERROR
214          104447                  PERR23= 104447          ;PROGRAM DETECTED ERROR
215          104450                  PERR24= 104450          ;PROGRAM DETECTED ERROR
216          104451                  PERR25= 104451          ;PROGRAM DETECTED ERROR
217          104452                  PERR26= 104452          ;PROGRAM DETECTED ERROR
218          104453                  PERR27= 104453          ;PROGRAM DETECTED ERROR
219          104454                  PERR30= 104454          ;PROGRAM DETECTED ERROR
220          104455                  PERR31= 104455          ;PROGRAM DETECTED ERROR
221          104456                  PERR32= 104456          ;PROGRAM DETECTED ERROR
222          104457                  PERR33= 104457          ;PROGRAM DETECTED ERROR
223          104460                  PERR34= 104460          ;PROGRAM DETECTED ERROR
224          104461                  PERR35= 104461          ;PROGRAM DETECTED ERROR
225          104462                  PERR36= 104462          ;PROGRAM DETECTED ERROR
226          104463                  PERR37= 104463          ;PROGRAM DETECTED ERROR
227          104464                  PERR40= 104464          ;PROGRAM DETECTED ERROR
228          104465                  PERR41= 104465          ;PROGRAM DETECTED ERROR
229          104466                  PERR42= 104466          ;PROGRAM DETECTED ERROR
230          104467                  PERR43= 104467          ;PROGRAM DETECTED ERROR
231
232          104470                  ECCDIS= 104470          ;DISABLE ECC ON ALL CSR'S
233          104471                  ECC1DIS=104471          ;DISABLE ECC ON 1 SELECTED CSR
234          104472                  ECCINIT=104472          ;INITIALIZE ALL MK11 CSR'S
235          104473                  ECC1INIT=104473         ;INITIALIZE 1 SELECTED MK11 CSR
236          104474                  CBCSR=  104474          ;WRITE GENERATED CHECKBITS IN ALL CSR'S
237          104475                  CB1CSR= 104475          ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
238          104476                  WASSBE= 104476          ;WAS THERE A SBE ON ANY CSR?
239          104477                  WAS1SBE=104477          ;WAS THERE A SBE ON 1 SELECTED CSR?
240          104500                  WASDBE= 104500          ;WAS THERE A DBE ON ANY CSR?
241          104501                  WAS1DBE=104501          ;WAS THERE A DBE ON 1 SELECTED CSR?
242          104502                  CLRCSR= 104502          ;CLEAR ALL CSR'S
243          104503                  CLR1CSR=104503          ;CLEAR 1 SELECTED CSR
244          104504                  CHKDIS= 104504          ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
245          104505                  CHK1DIS=104505          ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
246          104506                  ENASBE= 104506          ;ENABLE TRAPS ON SBE'S FROM ALL CSR'S
247          104507                  ENA1SBE=104507          ;ENABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
248          104510                  TSTREAD=104510          ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
249          104511                  INVALID=104511          ;INVALIDATE BACKGROUND PATTERN ON 'BANK'
```

```
                                .SBTTL  DEFINE  BASIC PDP11 STUFF

                        ;*INITIAL ADDRESS OF THE STACK POINTER
002000                  STACK=  2000            ;;FIRST ADDRESS OF THE STACK
002000                  KERSTK= STACK           ;;KERNEL STACK
000740                  SUPSTK= 740             ;;SUPERVISOR STACK
000700                  USESTK= 700             ;;USER STACK
104000                  ERROR=EMT               ;;BASIC DEFINITION OF ERROR CALL
000004                  SCOPE=IOT               ;;BASIC DEFINITION OF SCOPE CALL
177776                  PSW=    177776          ;;PROCESSOR STATUS WORD
                        ;STKLMT=177774          ;;STACK LIMIT REGISTER
                        ;PIRQ=  177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
177546                  LKS=    177546          ;;LINE CLOCK (KW11-L) STATUS REGISTER

                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE LINE FEED
000015                  CR=     15              ;;CODE CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED

                        ;*GENERAL PURPOSE REGISTER DEFINITIONS
                        ;SP=R6                  ;;STACK POINTER
                        ;KSP=SP                 ;;KERNEL STACK POINTER
000006                  SSP=SP                  ;;SUPERVISOR STACK POINTER
000006                  USP=SP                  ;;USER STACK POINTER
                        ;PC=R7                  ;;PROGRAM COUNTER

                        ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW9=    1000
000400                  SW8=    400
000200                  SW7=    200
000100                  SW6=    100
000040                  SW5=    40
000020                  SW4=    20
000010                  SW3=    10
000004                  SW2=    4
000002                  SW1=    2
000001                  SW0=    1

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT9=   1000
000400                  BIT8=   400
000200                  BIT7=   200
```

```
                        BIT6=   100
                        BIT5=   40
                        BIT4=   20
                        BIT3=   10
                        BIT2=   4
                        BIT1=   2
                        BIT0=   1

                        ;*BASIC ''CPU'' TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
                        ;TBITVEC=14             ;;''T'' BIT
                        ;TRTVEC=        14              ;;TRACE TRAP
                        ;BPTVEC=        14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;''TRAP'' TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
                        ;TPVEC= 64              ;;TTY PRINTER VECTOR
                        ;LKVEC= 100             ;;LINE CLOCK (KW11-L) VECTER
000114                  CACHVEC=114             ;;CACHE ERROR INTERRUPT VECTOR
000114                  PARVEC=CACHVEC
                        ;PIRQVEC=240            ;;PROGRAM INTERRUPT REQUEST VECTOR
000250                  MMVEC=  250             ;;MEMORY MANAGEMENT VECTOR
                                .SBTTL  DEFINE  CACHE REGISTERS
177740                  LOADRS = 177740         ;;LOWER 16 BITS OF ADDRESS THAT CAUSED ERROR
177742                  HIADRS = 177742         ;;UPPER SIX BITS OF ADDRESS THAT CAUSED ERROR
177744                  MEMERR = 177744         ;;CACHE ERROR REGISTER
177746                  CONTRL = 177746         ;;MEMORY CONTROL REGISTER
177750                  MAINT  = 177750         ;;MEMORY MAINTENENCE REGISTER
                        ;HITMIS = 177752                ;;HIT MISS REGISTER ''1'' IMPLIES HIT IN CACHE

                                .SBTTL  DEFINE  CPU REGISTERS
177760                  SIZELO = 177760         ;;MEMORY SIZE REGISTER NUMBER TO PUT INTO A PAR
                                                ;;TO GET TO THE LAST 32 WORDS OF MEMORY
                        ;SIZEHI = 177762                ;;HIGH SIZE REGISTER, RESERVED FOR FUTURE USE
                                                ;;CURRENTLY ALL ZERO
177764                  SYSTID = 177764         ;;SYSTEM ID REGISTER
177766                  CPUERR = 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED

                                .SBTTL  DEFINE  MEMORY MANAGEMENT REGISTERS
                                ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES
177572                  MMR0=   177572
177574                  MMR1=   177574
177576                  MMR2=   177576
172516                  MMR3=   172516

                                ;*USER ''I'' PAGE DESCRIPTOR REGISTERS
177600                  UIPDR0= 177600
                        ;UIPDR1=        177602
                        ;UIPDR2=        177604
                        ;UIPDR3=        177606
                        ;UIPDR4=        177610
                        ;UIPDR5=        177612
                        ;UIPDR6=        177614
                        ;UIPDR7=        177616
```

```
                                ;*USER 'D' PAGE DESCRIPTOR REGISTORS
                        ;UDPDR0=        177620
                        ;UDPDR1=        177622
                        ;UDPDR2=        177624
                        ;UDPDR3=        177626
                        ;UDPDR4=        177630
                        ;UDPDR5=        177632
                        ;UDPDR6=        177634
177636                  UDPDR7= 177636

                                ;*USER 'I' PAGE ADDRESS REGISTERS
177640                  FASTCITY=UIPAR0
177640                  UIPAR0= 177640          ;PATTERN PROGRAM SPACE
                        ;UIPAR1=        177642          ;PATTERN PROGRAM SPACE
177644                  UIPAR2= 177644          ;PATTERN PROGRAM SPACE
177646                  UIPAR3= 177646          ;PATTERN PROGRAM SPACE
177650                  UIPAR4= 177650          ;PATTERN PROGRAM SPACE
177652                  UIPAR5= 177652          ;PATTERN PROGRAM SPACE
177654                  UIPAR6= 177654          ;PATTERN PROGRAM SPACE
177656                  UIPAR7= 177656          ;PATTERN PROGRAM SPACE

                                ;*USER 'D' PAGE ADDRESS REGISTERS
177660                  UDPAR0= 177660          ;PATTERN PROGRAM SPACE
177662                  UDPAR1= 177662          ;PATTERN PROGRAM SPACE
                        ;UDPAR2=        177664          ;PATTERN PROGRAM SPACE
                        ;UDPAR3=        177666          ;PATTERN PROGRAM SPACE
                        ;UDPAR4=        177670          ;PATTERN PROGRAM SPACE
                        ;UDPAR5=        177672          ;PATTERN PROGRAM SPACE
                        ;UDPAR6=        177674          ;PATTERN PROGRAM SPACE
177676                  UDPAR7= 177676          ;PATTERN PROGRAM SPACE

                                ;*SUPERVISOR 'I' PAGE DESCRIPTOR REGISTERS
172200                  SIPDR0= 172200
                        ;SIPDR1=        172202
                        ;SIPDR2=        172204
                        ;SIPDR3=        172206
                        ;SIPDR4=        172210
                        ;SIPDR5=        172212
                        ;SIPDR6=        172214
                        ;SIPDR7=        172216

                                ;*SUPERVISOR 'D' PAGE DESCRIPTOR REGISTERS
                        ;SDPDR0=        172220
                        ;SDPDR1=        172222
                        ;SDPDR2=        172224
                        ;SDPDR3=        172226
                        ;SDPDR4=        172230
                        ;SDPDR5=        172232
                        ;SDPDR6=        172234
172236                  SDPDR7= 172236

                                ;*SUPERVISOR 'I' PAGE ADDRESS REGISTERS
172240                  SIPAR0= 172240
                        ;SIPAR1=        172242
                        ;SIPAR2=        172244
172246                  SIPAR3= 172246          ;TEST AREA
```

```
                                ;SIPAR4=        172250          ;TEST AREA
                                ;SIPAR5=        172252          ;TEST AREA
                                ;SIPAR6=        172254          ;TEST AREA
                                ;SIPAR7=        172256

                                        ;*SUPERVISOR 'D'' PAGE ADDRESS REGISTERS
172260                          SDPAR0= 172260
                                ;SDPAR1=        172262
                                ;SDPAR2=        172264
                                ;SDPAR3=        172266
                                ;SDPAR4=        172270
                                ;SDPAR5=        172272
                                ;SDPAR6=        172274
172276                          SDPAR7= 172276

                                        ;*KERNEL ''I'' PAGE DESCRIPTOR REGISTERS
172300                          KIPDR0= 172300
                                ;KIPDR1=        172302
                                ;KIPDR2=        172304
                                ;KIPDR3=        172306
                                ;KIPDR4=        172310
                                ;KIPDR5=        172312
                                ;KIPDR6=        172314
                                ;KIPDR7=        172316

                                        ;*KERNEL 'D'' PAGE DESCRIPTOR REGISTERS
                                ;KDPDR0=        172320
                                ;KDPDR1=        172322
                                ;KDPDR2=        172324
                                ;KDPDR3=        172326
                                ;KDPDR4=        172330
                                ;KDPDR5=        172332
                                ;KDPDR6=        172334
172336                          KDPDR7= 172336

                                        ;*KERNEL ''I'' PAGE ADDRESS REGISTERS
172340                          KIPAR0= 172340
                                ;KIPAR1=        172342
                                ;KIPAR2=        172344
                                ;KIPAR3=        172346
172350                          KIPAR4= 172350
172352                          KIPAR5= 172352
172354                          KIPAR6= 172354
172356                          KIPAR7= 172356

                                        ;*KERNEL 'D'' PAGE ADDRESS REGISTERS
172360                          KDPAR0= 172360
                                ;KDPAR1=        172362
                                ;KDPAR2=        172364
                                ;KDPAR3=        172366
                                ;KDPAR4=        172370
                                ;KDPAR5=        172372
                                ;KDPAR6=        172374
172376                          KDPAR7= 172376

```

```
                                .SBTTL  DEFINE  UNIBUS MAP REGISTERS
                                ;*THE LOWER 16 BITS OF THE MAP REGISTERS ARE LABELED 'MAPLXX'
                                ;*THE UPPER 6 BITS OF THE MAP REGISTERS ARE LABELED 'MAPHXX'
170200                  MAPL0 = 170200
170202                  MAPH0 = 170202
170204                  MAPL1 = 170204
                        ;MAPH1 = 170206
                        ;MAPL2 = 170210
                        ;MAPH2 = 170212
                        ;MAPL3 = 170214
                        ;MAPH3 = 170216
                        ;MAPL4 = 170220
                        ;MAPH4 = 170222
                        ;MAPL5 = 170224
                        ;MAPH5 = 170226
                        ;MAPL6 = 170230
                        ;MAPH6 = 170232
                        ;MAPL7 = 170234
                        ;MAPH7 = 170236
                        ;MAPL10 = 170240
                        ;MAPH10 = 170242
                        ;MAPL11 = 170244
                        ;MAPH11 = 170246
                        ;MAPL12 = 170250
                        ;MAPH12 = 170252
                        ;MAPL13 = 170254
                        ;MAPH13 = 170256
                        ;MAPL14 = 170260
                        ;MAPH14 = 170262
                        ;MAPL15 = 170264
                        ;MAPH15 = 170266
                        ;MAPL16 = 170270
                        ;MAPH16 = 170272
                        ;MAPL17 = 170274
                        ;MAPH17 = 170276
                        ;MAPL20 = 170300
                        ;MAPH20 = 170302
                        ;MAPL21 = 170304
                        ;MAPH21 = 170306
                        ;MAPL22 = 170310
                        ;MAPH22 = 170312
                        ;MAPL23 = 170314
                        ;MAPH23 = 170316
                        ;MAPL24 = 170320
                        ;MAPH24 = 170320
                        ;MAPL25 = 170324
                        ;MAPH25 = 170326
                        ;MAPL26 = 170330
                        ;MAPH26 = 170332
                        ;MAPL27 = 170334
                        ;MAPH27 = 170336
                        ;MAPL30 = 170340
                        ;MAPH30 = 170342
                        ;MAPL31 = 170344
                        ;MAPH31 = 170346
                        ;MAPL32 = 170350
                        ;MAPH32 = 170352
```

```
                                ;MAPL33 = 170354
                                ;MAPH33 = 170356
                                ;MAPL34 = 170360
                                ;MAPH34 = 170362
                                ;MAPL35 = 170364
                                ;MAPH35 = 170366
170370                          MAPL36 = 170370
170372                          MAPH36 = 170372
                                ;MAPL37 = 170374
170376                          MAPH37 = 170376

                                        .SBTTL  DEFINE  SOFTWARE SWITCH & DISPLAY REGISTERS
000174                          DISPREG=174
000176                          SWREG=  176

                                        .SBTTL  DEFINE  MK11 REGISTERS
172100                          MK11ADD=172100

                                        .SBTTL  DEFINE  PARAMETERS
060000                          FIRST=60000                     ;START OF THE 16K TEST PATTERN AREA
157776                          LAST=157776                     ;END OF THE 16K TEST PATTERN AREA
040000                          SIZE=40000                      ;SIZE OF THE 16K TEST PATTERN AREA (FOR SOB INSTRUCTIONS)
011661                          SECONDS=11661                   ;CONSTANT FOR LENGTH OF TIME FOR HUNG CPU TEST
                                        .SBTTL  DEFINE MASTER & SLAVE BITS
000020                          MASTER=20
000040                          SLAVE1=40
000100                          SLAVE2=100
000200                          SLAVE3=200
```

```
                        .LIST   MD                      ;BE NICE TO SEE MY DEFINITIONS
                        .SBTTL  MACRO   FATAL
                ;********************* FATAL *************************
                ;
                ;FATAL IS USED TO REPORT FATAL ERRORS (ERRORS THAT PREVENT
                ;       THE PROGRAM FROM CONTINUING).
                ;
                ;*****************************************************
                        .MACRO  FATAL   ARG             ;***MACRO***MACRO***MACRO***
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        INC     FATAL$                  ;SET FATAL INDICATOR
                        ERROR   +ARG
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   FATAL

                        .SBTTL  MACRO   TYPE
                        .MACRO  TYPE    ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        .IF B ARG
                        TYPEIT
                        .IFF
                        TYPEIT  .ARG
                        .ENDC
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPE
```

```
                        .SBTTL  MACRO   NEWTST
                ;********************* NEWTST *********************
                ;NEWTST IS USED AS THE FIRST INSTRUCTION OF A TEST.
                ;IT WILL:
                ;1)  GENERATE A TEST NUMBER FOR THE LABEL OF THIS TEST
                ;2)  PUT STARS BEFORE AND AFTER A MESSAGE
                ;ARGUMENTS
                ;1)  ASCII  --  THIS IS THE MESSAGE THAT WILL APPEAR
                ;               ON THE LISTING
                ;2)  ICOUNT --  IF NON-BLANK AND BIT 11 OF $SWR = 1 IT WILL BE
                ;               THE NUMBER OF ITERATIONS TO MAKE ON THIS TEST
                ;3)  RETURN --  IF NON-BLANK WILL BE THE ADDRESS TO
                ;               WHICH THE NEXT SCOPE STATEMENT WILL
                ;               LOOP BACK TO.
                ;4)  COMAND --  IF NON-BLANK WILL BE THE FIRST
                ;               INSTRUCTION OF THE TEST
                ;               IF BLANK SCOPE WILL BE THE
                ;               FIRST INSTRUCTION
                ;*************************************************
                        .MACRO  NEWTST  ASCII,ICOUNT,RETURN,COMAND
                        $STN=1
                        $NWTST=0
                        .NLIST  MC
                        .IF B <COMAND>
                        $$NEWTEST       \$TN,<ASCII>,SCOPE
                        .IFF
                        $$NEWTEST       \$TN,<ASCII>,<COMAND>
                        .ENDC
                        .NLIST
                        .LIST   ME
                        .LIST
                        .IF NE 4000&$SWR
                        .IF NB ICOUNT
                        .IF LE <ICOUNT-1>
                        MOV     #1,$TIMES       ;;DO 1 ITERATION
                        .IFF
                        MOV     #ICOUNT,$TIMES  ;;DO ICOUNT ITERATIONS
                        .ENDC
                        .ENDC
                        .IF NB RETURN
                        MOV     #RETURN,$LPADR  ;;SET SCOPE LOOP ADDRESS
                        .ENDC
                        .ENDC
                        .NLIST
                        .LIST   MC
                        .LIST
                        .NLIST  ME
                        .ENDM   NEWTST
```

```
                        .SBTTL  MACRO   $$NEWTEST
                        .MACRO  $$NEWTEST       A,ASC,COMND
                        .IRP    ASCI,<ASC>
                        .IF EQ $NWTST
                        $NWTST=1
                        .SBTTL  T'A'    ASCI
                        .NLIST
                        .LIST   ME
                        .LIST
                ;*******************************************************************************
                ;*TEST A         ASCI
                        .IFF
                        ASCI
                        .ENDC
                        .ENDM
                ;*******************************************************************************
                TST'A:  COMND
                        .NLIST  ME
                        $TN=$TN+1
                        .ENDM   $$NEWTEST

                        .SBTTL  MACRO   SUBTST
                ;************** SUBTST ******************************
                ;
                ;THIS MACRO WILL FORMAT A SUBTEST HEADING WITH STARS
                ;A .SBTTL WILL BE FORCED & .NLISTED FOR THE TABLE OF CONTENTS.
                ;
                ;ARGUMENT:
                ;1) TXT --      THIS IS THE MESSAGE THAT WILL APPEAR IN THE TABLE OF CONTENTS & LISTING.
                ;
                ;EXAMPLE:       SUBTST  <<THIS IS A FUN SUBTST>>
                ;
                ;************************************************************

                        .MACRO  SUBTST  ASCII
                        .NLIST  MC
                        $SUBTST <ASCII>
                        .LIST   MC
                        .ENDM   SUBTST

                        .SBTTL  MACRO   $SUBTST
                        .MACRO  $SUBTST ASC
                        .IRP    ASCI,<ASC>
                        .SBTTL  ASCI
                        .NLIST
                        .LIST   ME
                        .LIST
                ;*******************************************************************************
                ;*SUBTEST        ASCI
                        .ENDM
                ;*******************************************************************************
                        .NLIST  ME
                        .ENDM   $SUBTST
```

```
                                .SBTTL  MACRO   TYPOCT
                        ;********** TYPOCT **********
                        ;
                        ;TYPOCT IS USED TO CHANGE A BINARY NUMBER
                        ;       TO A 6 DIGIT OCTAL NUMBER AND TYPE IT
                        ;
                        ;ARGUMENTS:
                        ;
                        ;1)     NUM     THE NUMBER TO BE TYPED
                        ;
                        ;2)     REMARK  ALLOWS A COMMENT TO BE MADE
                        ;
                        ;ROUTINES REQUIRED
                        ;
                        ;1)     CONVERT BINARY TO OCTAL AND TYPE (.$TYPOCT)
                        ;
                        ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                        ;
                        ;EXAMPLES:
                        ;
                        ;1)     TYPOCT  HILMT,<TYPES THE CONTENTS OF HILMT>
                        ;2)     TYPOCT  #5,<TYPES ' 000005'>
                        ;
                        ;*****************************************************************

                                .MACRO  TYPOCT  NUM,REMARK
                                .NLIST
                                .DSABL  CRF
                                .IIF DF LST$$ .LIST  ME
                                .ENABL  CRF
                                .LIST
                                MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                                .IIF NB <REMARK>,                       ;;REMARK
                                TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                .DSABL  CRF
                                .IIF DF LST$$ .NLIST  ME
                                .ENABL  CRF
                                .ENDM   TYPOCT
```

```
                        .SBTTL  MACRO   TYPOCS
                ;******************** TYPOCS ********************
                ;
                ;TYPOCS IS USED TO CHANGE A BINARY NUMBER TO AN OCTAL
                ;       NUMBER AND TYPE 1 TO 6 DIGITS
                ;       WITH OR WITHOUT LEADING ZEROS.
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     NUMBER TO BE TYPED
                ;
                ;2)     REMARK  ALLOWS A COMMENT TO BE MADE
                ;
                ;3)     N       NUMBER OF DIGITS (1 TO 6) TO BE TYPED
                ;
                ;4)     Z       BLANK=SUPPRESS LEADING ZEROS (TYPES SPACES)
                ;               NON-BLANK=TYPE LEADING ZEROS
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO OCTAL AND TYPE (.$TYPOCT)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES:
                ;1)     TYPOCS  #12345,<TYPES '5'>,1
                ;2)     TYPOCS  #004,<TYPES '04'>,2,X
                ;3)     TYPOCS  #004,<TYPES '' 4'>,2
                ;
                ;*****************************************************************
                ;
                        .MACRO  TYPOCS  NUM,REMARK,N,Z
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                        .IIF NB <REMARK>,                               ;;REMARK
                        TYPOS                   ;;GO TYPE--OCTAL ASCII
                        .IF NB N
                        .BYTE   N               ;;TYPE N DIGIT(S)
                        .IFF
                        .BYTE   6               ;;TYPE 6 DIGITS
                        .ENDC
                        .IF NB Z
                        .BYTE   1               ;;TYPE LEADING ZEROS
                        .IFF
                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
                        .ENDC
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPOCS
```

```
                                        .SBTTL  MACRO   TYPDEC
                                ;********************* TYPDEC ********************
                                ;
                                ;TYPDEC IS USE TO CHANGE A BINARY NUMBER TO A SIGNED
                                ;       DECIMAL NUMBER AND TYPE IT REPLACING LEADING ZERO
                                ;       WITH SPACES.
                                ;NOTE:  IF THE NUMBER IS NEGATIVE A
                                ;       MUNUS SIGN WILL BE TYPED.
                                ;
                                ;ARGUMENTS:
                                ;
                                ;1)     NUM     NUMBER TO BE TYPED
                                ;
                                ;2)     REMARK ALLOWS A COMMENT TO BE MADE
                                ;
                                ;ROUTINES REQUIRED
                                ;
                                ;1)     CONVERT BINARY TO DECIMAL AND TYPE (.$TYPDEC)
                                ;
                                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                                ;
                                ;EXAMPLES
                                ;
                                ;1)     TYPDEC  SIZE,<TYPE THE CONTENTS OF SIZE>
                                ;2)     TYPDEC  #-10.,<TYPE A MINUS TEN>
                                ;
                                ;*************************************************************

                                        .MACRO  TYPDEC  NUM,REMARK
                                        .NLIST
                                        .DSABL  CRF
                                        .IIF DF LST$$ .LIST  ME
                                        .ENABL  CRF
                                        .LIST
                                        MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                                        .IIF NB <REMARK>,                       ;;REMARK
                                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                        .DSABL  CRF
                                        .IIF DF LST$$ .NLIST  ME
                                        .ENABL  CRF
                                        .ENDM   TYPDEC
```

```
                        .SBTTL  MACRO   BMOV
                ;*************** BMOV ***************************
                ;
                ; THIS MACRO MOVES A BLOCK OF DATA.
                ;
                ;ARGUEMENTS:
                ;
                ;1)     FROMHERE        THE FIRST ADDRESS OF THE SOURCE BLOCK.
                ;
                ;2)     TOHERE          THE FIRST ADDRESS OF THE DESTINATION BLOCK.
                ;                       IF BLANK THE 1ST ADDRESS OF THE USER INSTRUCTION
                ;                       PAR'S IS USED (FASTCITY).
                ;
                ;3)     SIZE            THE SIZE OF THE SOURCE BLOCK.
                ;                       IF BLANK A 16 WORD TRANSFER IS ASSUMED.
                ;                       'WHY DEFAULT TO 16 WORDS?'' YOU ASK!
                ;                       'BECAUSE THAT'S HOW MANY WORDS TO THE USER PAR
                ;                       REGISTERS & THAT'S WHERE I INTEND TO MOVE LOTS
                ;                       OF STUFF.'' I REPLY!
                ;
                ;*********************** ***************************

                .MACRO  BMOV    FROMHERE,TOHERE,SIZE
                  .IF B TOHERE
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK1
                    FROMHERE
                    .DSABL      CRF
                    .IIF DF LST$$ .NLIST  ME
                    .ENABL      CRF
                    .MEXIT
                  .ENDC
                  .IF B SIZE
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK2
                    TOHERE
                    FROMHERE
                    .DSABL      CRF
                    .IIF DF LST$$ .NLIST  ME
                    .ENABL      CRF
                    .MEXIT
                  .IFF
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK3
                    SIZE
```

```
                        TOHERE
                        FROMHERE
                        .DSABL      CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL      CRF
                    .ENDC
                .ENDM   BMOV
```

```
                        .SBTTL  MACRO   MAP
                ;***************** MAP ****************************
                ;
                ; THIS MACRO MAPS A MEMORY BANK (16K) INTO THE
                ; TEST PATTERN AREA (SUPERVISOR VIRTUAL (60000-157777)).
                ;
                ;ARGUEMENTS:
                ;
                ;1)     BANK    THE BANK OF 16K WORDS TO BE MAPPED.
                ;               THERE ARE 120 BANKS OF 16K WORDS
                ;
                ;EXAMPLES
                ;
                ;       MAP     LOC             ;LOCATION 'LOC' CONTAINS THE # OF THE BANK TO MAP
                ;
                ;       MAP     #28.            ;BANK 34 (OCTAL) WILL BE MAPPED
                ;
                ;***************************************************
                .MACRO  MAP     BANK
                PUSH    R3
                .NLIST
                .DSABL  CRF
                .IIF DF LST$$ .LIST  ME
                .ENABL  CRF
                .LIST
                .IF B BANK
                MOV     #120.,R3
                .IFF
                MOV     BANK,R3
                .ENDC
                CALL    MAPPER
                .DSABL  CRF
                .IIF DF LST$$ .NLIST  ME
                .ENABL  CRF
                POP     R3
                .ENDM   MAP
```

```
                        .SBTTL  MACRO   SUPERVISOR
                ;*************** SUPERVISOR ********************
                ;
                ; THIS MACRO SWITCHES TO SUPERVISOR MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;***************************************************

                        .MACRO  SUPERVISOR
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     #BIT14,PSW              ;DO IT TO IT!
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   SUPERVISOR

                        .SBTTL  MACRO   USER
                ;*************** USER **********************
                ;
                ; THIS MACRO SWITCHES TO USER MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;***************************************************

                        .MACRO  USER
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     #BIT15!BIT14,PSW                ;DO IT TO IT!
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   USER
```

```
                        .SBTTL  MACRO   SET4 & RES4
                ;****************** SET4 & RES4 ********************
                ;
                ; THESE MACROS SET & RESTORE VECTOR 4(TIMEOUT TRAP)
                ;
                ; IN IT'S RESTORED MODE TRAPS ARE REPORTED AS SUCH.
                ;
                ;ARGUEMENTS:    LOC     ;THE LOCATION TO VECTOR TO (ONLY USED IN ''SET4'' NOT ''RES4'')
                ;
                ;I USE THE SET4 AND RES4 MACROS AROUND CODE THAT I EXPECT TO TRAP TO 4
                ;LIKE LOOKING FOR ALL POSSIBLE CSR'S AND ETC.  WHENEVER CODE IS NOT
                ;SURROUNDED BY SET4 AND RES4 THEN ANY TRAPS TO 4 WILL CAUSE AN ERROR
                ;PRINTOUT THAT SAYS 'UNEXPECTED TRAP TO 4'' AND ALL THE ASSOCIATED REGISTER JUNK
                ;*****************************************************

                        .MACRO  SET4    ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     ARG,4
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   SET4

                        .MACRO  RES4
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     #TIMEOUT,4
                        CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                ;THAT A EXPECTED TRAP COULD HAVE SET
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   RES4
```

```
                                .SBTTL  MACRO   DLEFT
                        ;***************** DLEFT ************************
                        ;
                        ; THIS MACRO DOES A DOUBLE WORD LEFT SHIFT
                        ;
                        ;ARGUEMENTS:    LOC     ;THE LOCATION TO BE SHIFTED LEFT (CARRY TO LOC+2)
                        ;
                        ;************************************************

                                .MACRO  DLEFT   ARG
                                .NLIST
                                .DSABL  CRF
                                .IIF DF LST$$ .LIST  ME
                                .ENABL  CRF
                                .LIST
                                ROL     ARG
                                ROL     ARG+2
                                .DSABL  CRF
                                .IIF DF LST$$ .NLIST  ME
                                .ENABL  CRF
                                .ENDM   DLEFT
                                .NLIST  MD              ;DON'T NEED TO SEE THEM ANY MORE
```

```
                                        .SBTTL  TRAP CATCHER
                000000                  .-0
000000  000000  000000                  .WORD   0,0
                000177                  .REPT   177             ;.WORD  .+2,HALT
                                        .SBTTL  ACT11 HOOKS
                                ;*THE HOOKS REQUIRED BY ACT11 ARE DEFINED AND SETUP BELOW:
                                ;*      DEFINITIONS:
                                ;*                      1)LOC.46        'END-OF-PASS'' HOOK
                                ;*                              -ADDRESS OF END OF PASS ROUTINE
                                ;*                               MODIFIED BY ACT11.
                                ;*                      2)LOC.52        PROGRAM NEEDS HOOK
                                ;*                              BIT 15=1 PROGRAM SHOULD BE POWER
                                ;*                                       FAILED WHILE RUNNING
                                ;*                                     =0 NO POWER FAIL
                                ;*                              BIT 14=1 PROGRAM MEMORY SIZE DEPENDENT
                                ;*                                     -0 NOT MEMORY SIZE DEPENDENT
                                ;*                              BIT 13=1 PROGRAM REQUIRES MANUAL INTERVENTION
                                ;*                                     =0  MANUAL INTERVENTION NOT REQUIRED
                                ;*                              BITS 12-0  MUST BE ZERO'S
                000046                  .=46
000046  015000                  $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                000052                  .=52
000052  040000                  .WORD   BIT14                   ;;2)SET LOC.52 TO INDICATE MEMORY SIZE DEPENDANT
                                        .SBTTL  APT11 HOOKS
                000024                  .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
                000042                  .=42
000042  002000                  STACK                           ;SO RT11 CAN START WITH RUN COMMAND
                000044                  .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  075236                  $APTHDR ;;POINT TO APT HEADER BLOCK
                000200                  . 200
000200  000437          START3: BR      START1                  ;'NORMAL'' START
000202  000442                  BR      START2                  ;RESTART (SAVE ERROR ACCOUNTING)
000204  000446                  BR      START4                  ;'RUN MULTIPROCESSOR TESTS WITHOUT THE IIS'' START
                000300                  . 300
000300  005037  002752  START1: CLR     RESTART
000304  000137  004352          JMP     START
000310                  START2: SET     RESTART
000316  000137  004352          JMP     START
000322                  START4: SET     NOIIST
000330  000137  000300          JMP     START1
                002000                  . STACK
```

```
                                        .SBTTL  VARIABLES       INITIALIZED TO ZERO
                                ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
                                ;*USED IN THE PROGRAM.
002000                          $CMTAG:                         ;;START OF COMMON TAGS
002000  000000                  BADCSR: 0                       ;CSR DETERMINED TO HAVE AN ERROR BY BAD BOX ROUTINE
002002  000000                  SELONLY:0                       ;SELECT ONLY BANKS MARKED BY FIELD SERVICE MODE FLAG
002004  000000                  MULTIONLY:0                     ;RUN ONLY MULTIPORT TESTS FLAG
002006  000000                  DIAGFLAG:0                      ;SET FOR SHIFTING DIAGONAL TEST
002010  000000                  KAMIKAZE:0                      ;SET FOR KAMIKAZE MODE TESTING
002012  000000                  SKIPKAMI:0                      ;USED TO SKIP RESTORING KAMIKAZE MODE WHEN MODIFIED
                                ;NEXT TWO BYTES ARE DISPLAYED IN THE DISPLAY REGISTER
002014      000                 $PATMAR:.BYTE   0               ;PATTERN NUMBER & MARGIN VALUE
002015      000                 $BANK:  .BYTE   0               ;BANK & SIGN = MARGIN INDICATOR
002016      000                 $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
002017      000                 $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
002020  000000                  LASTERROR:.WORD 0               ;NUMBER OF ERRORS ON LAST PASS
002022  000000                  SBEFLAG:.WORD   0               ;A SINGLE BIT ERROR HAS OCCURED THIS PASS
002024  000000                  ERRPC:  .WORD   0               ;CONTAINS PC OF ERROR FOR TYPEOUT
002026  000000                  BADPC:  .WORD   0               ;CONTAINS PC OF ERROR
002030  000000                  ERRSP:  .WORD   0               ;CONTAINS SP OF ERROR FOR TYPEOUT
002032  000000                  BADSP:  .WORD   0               ;CONTAINS SP OF ERROR
002034  000000                  ERRPSW: .WORD   0               ;CONTAINS PSW OF ERROR FOR TYPEOUT
002036  000000                  BADPSW: .WORD   0               ;CONTAINS PSW OF ERROR
002040  000000                  ADDRESS:.WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
002042  000000                  PADDRESS:.WORD  0               ;ADDRESS OF PARITY ERROR
002044  000000  000000          PHYADD: .WORD   0,0             ;22 BIT PHYSICAL ADDRESS
002050  000000                  GOOD:   .WORD   0               ;;CONTAINS 'GOOD' DATA
002052  000000                  GOOD2:  .WORD   0               ;;CONTAINS 'GOOD2' DATA
002054  000000                  GOOD3:  .WORD   0               ;;CONTAINS 'GOOD3' DATA
002056  000000                  BAD:    .WORD   0               ;;CONTAINS 'BAD' DATA
002060  000000                  BAD2:   .WORD   0               ;;CONTAINS 'BAD2' DATA
002062  000000                  BAD3:   .WORD   0               ;;CONTAINS 'BAD3' DATA
002064  000000                  BADXOR: .WORD   0               ;XOR OF GOOD & BAD = BAD BITS'
002066  000000                  $AUTO:  .WORD   0               ;;AUTOMATIC MODE INDICATOR FOR APT,ACT, & XXDP
002070  000000                  FATAL$: .WORD   0               ;FATAL ERROR INDICATOR
002072  000000                  NEMCNT: 0                       ;NON-EXISTANT MEMORY COUNTER (HOLES)
002074  000000                  PARCNT: 0                       ;PARITY ERROR COUNTER
002076  000000                  PATERR: 0                       ;PATTERN ERROR COUNTER
002100  000000                  NOPAR:  0                       ;NO PARITY ERROR MODE INDICATOR
002102  000000                  NONEM:  0                       ;NO NON-EXISTANT MEMORY (HOLES) MODE INDICATOR
002104  000000                  NOCLOCK:0                       ;NO LINE CLOCK IS ON THIS SYSTEM
002106  000000                  BANK:   0                       ;MEMORY BANK UNDER TEST
002110  000000                  BANKINDEX:0                     ;USED TO INDEX INTO CONFIG TABLE
002112  000000                  MARGIN: 0                       ;INDICATES WHICH MARGIN IS IN PROGRESS
002114  000000                  CPUBIT: 0                       ;CONTAINS 1 BIT TO IDENTIFY CPU TO CONFIGURATION TABLE
002116  000000                  MUT:    0                       ;MEMORY UNDER TEST FLAG
002120  000000                  PATTERN:0                       ;PATTERN NUMBER UNDER TEST
002122  000000                  KPFLAG: 0                       ;BANK IS PROTECTED REGION OF MK11
002124  000000                  ACFLAG: 0                       ;BANK CAN BE ACCESSED BY THIS CPU
002126  000000                  MKFLAG:0                        ;IF SET INDICATES MK11 UNDER TEST
002130  000000                  PFLAG:  0                       ;BANK IS IN PROGRAM SPACE
002132  000000                  RRFLAG: 0                       ;BANK IS WHERE PROGRAM RELOCATION IS REQUIRED TO TEST
002134  000000                  RLFLAG: 0                       ;PROGRAM IS RELOCATED FLAG
002136  000000                  BMFLAG: 0                       ;"BANK IS IDENTIFIED AS BAD MEMORY" FLAG
002140  000000                  TMFLAG: 0                       ;"TYPE OF MEMORY TO TEST" FLAG; 0 - MK11
002142  000000                  ABORTFLAG:0                     ;"ABORT OCCURED" FLAG
002144  000000  000000          CSR:    .WORD   0,0             ;DATA TO OR FROM CSR
```

```
1168 002150  000000  000000          SBECSR: .WORD   0,0                ;CSR STORED HERE ON MK11 DETECTED SBE'S
1169 002154  000000  000000  000000  CSR0:   .WORD 0,0,0,0,0,0,0,0      ;SAVE CSR'S AFTER GETSIZE CALL
     002162  000000  000000  000000
     002170  000000  000000
1170 002174  000000  000000  000000  CSR2:   .WORD 0,0,0,0,0,0,0,0      ;SAVE CSR+2'S AFTER GETSIZE CALL
     002202  000000  000000  000000
     002210  000000  000000
1171 002214  000000  000000  000000  CSRFB:  .WORD 0,0,0,0,0,0,0,0      ;SAVE FIRSTB'S AFTER GETSIZE CALL
     002222  000000  000000  000000
     002230  000000  000000
1172 002234  000000  000000  000000  CSRLB:  .WORD 0,0,0,0,0,0,0,0      ;SAVE LASTB'S AFTER GETSIZE CALL
     002242  000000  000000  000000
     002250  000000  000000
1173 002254  000000                  CSRREL: .WORD 0                    ;CSR'S ARE RELOCATED TO SHADOW MEMORY FLAG
1174 002256  000000                  CSRNO:  0                          ;CSR ADDRESS NUMBER (3 LSB'S)
1175 002260  000000                  FIRSTB: 0                          ;FIRST BANK CONTROLLED BY THIS CSR
1176 002262  000000                  LASTB:  0                          ;LAST BANK CONTROLLED BY THIS CSR
1177 002264  000000                  INTERL: 0                          ;INTERLEAVE FACTOR (0,1,2,3)
1178                                 ;THESE LOCATIONS STORE GPR'S DURING SUPERVISOR TESTS
1179 002266  000000                  SUPDR0: 0
1180 002270  000000                  SUPDR1: 0
1181 002272  000000                  SUPDR2: 0
1182 002274  000000                  SUPDR3: 0
1183 002276  000000                  SUPDR4: 0
1184 002300  000000                  SUPDR5: 0
1185 002302  000000                  SUPDR6: 0
1186 002304  000000                  DUMMY:  0                          ;DUMMY LOCATION FOR ADDRESS PASSING
1187                                 ;THESE LOCATIONS STORE GPR'S & PSW DURING DETAILED ERROR PRINTOUTS
1188 002306  000000                  DETR0:  0
1189 002310  000000                  DETR1:  0
1190 002312  000000                  DETR2:  0
1191 002314  000000                  DETR3:  0
1192 002316  000000                  DETR4:  0
1193 002320  000000                  DETR5:  0
1194 002322  000000                  DETSP:  0
1195 002324  000000                  DETPSW: 0
1196 002326  000000                  DETFLAG:0                          ;DETAILED REPORT FLAG
1197 002330  000000                  PENDBOX:0                          ;1 BIT PER EXISTING CSR THAT STARTS AT A BANK ABOVE 166
1198                                                                    ;CSR'S 0,1,2,3,4,5,6,7 REPRESENTED BY BITS
1199                                                                    ;7,6,5,4,3,2,1,0 RESPECTIVELY
1200 002332  000000                  CONTFLAG:0                         ;MK11 CONTROL'S HAVE BEEN TESTED FLAG
1201 002334  000000                  MKCSRS: .WORD   0       ;LO BYTE;1 BIT PER EXISTING CSR
1202                                                                    ;CSR'S 0,1,2,3,4,5,6,7 REPRESENTED BY BITS
1203                                                                    ;7,6,5,4,3,2,1,0 RESPECTIVELY
1204                                                           ;HI BYTE;1 BIT PER EXISTING CSR WITH INTERNAL INTERLEAVE
1205                                                                    ;INTERNAL INTERLEAVE REPRESENTED BY BITS
1206                                                                    ;15,14,13,12,11,10,9,8 RESPECTIVELY
1207 002336  000000                  CSRFIRST:0                         ;FIRST ADDRESS UNDER CONTROL OF THIS CSR
1208 002340  000000  000000          DATBUF: .WORD   0,0                ;TWO WORD DATA BUFFER
1209 002344  000000  000000          TSTDAT: .WORD   0,0                ;TWO WORD TEST DATA
1210 002350  000000  000000          SBEMSK: .WORD   0,0                ;TWO WORD SINGLE BIT ERROR MASK
1211 002354  000000  000000          DBEMSK: .WORD   0,0                ;TWO WORD DOUBLE BIT ERROR MASK
1212 002360  000000                  SUPDOADD:0                         ;ADDRESS OF SUBROUTINE TO EXECUTE IN SUPERVISOR MODE
1213 002362     000                  PASFLG: .BYTE   0                  ;LOCAL LOOP PASS CONTROL
1214 002363     000                  UPPFLG: .BYTE   0                  ;LOCAL LOOP PASS CONTROL
1215 002364  000000                  STRTDI: 0                          ;LOAD STRTDI WITH THE STARTING ADDRESS OF THE DIAGONAL
1216 002366  000000                  REALPAT:0                          ;REAL PATTERN UNDER TEST
```

```
1217 002370  000000                OLDCACHE:0                      ;BACKED UP VALUE OF CACHE CONTROL REGISTER
1218 002372  000000                PARTHERE:0                      ;PARITY TRAPS SOMETIMES GO TO ADDRESS STORED HERE
1219 002374  000000                FSSTACK:0                       ;STACK SAVED HERE IF IN FIELD SERVICE MODE
1220 002376  000000                OLDMARGIN:0                     ;BACKED UP VALUE OF LAST MARGIN SETTING
1221 002400  000000                NEWBANK:0                       ;USED FOR RELOCATION TO A NEW BANK
1222 002402  000000                SOURCE: .WORD 0                 ;SOURCE OF DATA WORDS FOR CHECKBIT GENERATION SUBROUTINE
1223 002404  000000                CHECK:  .WORD 0                 ;CHECKBITS TO BE LOADED INTO CSR
1224 002406  000000                PCBUMP: .WORD 0                 ;VALUE TO BUMP THE PC BY TO RECOVER AFTER A PARITY TRAP
1225 002410  000000                CSRFBANK:0                      ;FIRST BANK OWNED (AT LEAST IN PART) BY THIS CSR
1226 002412  000000                CSRLBANK:0                      ;LAST BANK OWNED (AT LEAST IN PART) BY THIS CSR
1227 002414  000000                CSRINC: 0                       ;VALUE TO INCREMENT ADDRESS BY TO REMAIN IN THE SAME CSR
1228 002416     000                CSRINDEX:.BYTE  0               ;AN INDEX VARIABLE FOR A CSR LOOP
1229 002417     000                CSROUDEX:.BYTE  0               ;AN INDEX VARIABLE FOR A CSR LOOP
1230 002420  000000                CSRLOOP:0                       ;LOOP CONTROL FOR CSR TESTING
1231 002422  000000                SIDE:   0                       ;INDEX VARIABLE FOR EACH SIDE (CONTROLLER) OF A CSR
1232 002424  000000                SUCCESS:0                       ;FLAG SET BY SUCCESSFULL TASK OR SUBROUTINE
1233 002426  000000                ZERO:   0                       ;FOR AID IN "MOV" INSTRUCTIONS
1234 002430  000000                ZEROS:  0                       ;FOR AID IN "MOV" INSTRUCTIONS
1235 002432  000000                SPECIAL:0                       ;FLAG FOR SPECIAL CASE OF NO INTERNAL INTERLEAVE
1236 002434  000000                TIME:   0                       ;SECONDS THAT BATTERIES SHOULD LAST
1237 002436  000000                NULLFLAG:0                      ;SET WHEN RUNNING NULL PATTERNS
1238 002440  000000                QVFLAG: 0                       ;FLAGS QUICK VERIFY PASS UNDER APT, ACT, OR XXDP CHAIN MODE
1239 002442  000000                ACTFLAG:0                       ;FLAGS ACT AUTOMATIC MODE PROGRAMMING RULES
1240 002444  000000                APTFLAG:0                       ;FLAGS APT AUTOMATIC MODE PROGRAMMING RULES
1241 002446  000000                XXDPCHAIN:0                     ;FLAGS XXDP CHAIN MODE PROGRAMMING RULES
1242                               ;NOTE: THESE TWO BYTES MUST STAY TOGETHER
1243 002450     000                $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
1244 002451     000                $FILLS: .BYTE   0               ;CONTAINS # OF FILL CHARACTERS
1245 002452     000                $TPFLG: .BYTE   0               ;;"TERMINAL NOT AVAILABLE" FLAG
1246                                       .EVEN
1247 002454  000000                $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
1248 002456  000000                EVEN:   0                       ;USED FOR ALTERNATE DATA PATTERNS
1249 002460  000000                STRIPES:0                       ;COUNTS DIAGONAL STRIPES
1250 002462  000000                COUNT:  0                       ;BACKED UP COPY OF STRIPES
1251 002464  000000                NOTAB:  0                       ;NO TABLE BEING PRINTED - NOW
1252 002466  000000                MUSIZE: 0                       ;SIZE OF MU11 MEMORY IN K WORDS
1253 002470  000000                MKSIZE: 0                       ;SIZE OF MK11 MEMORY IN K WORDS
1254 002472  000000                TOOMANY:0                       ;FLAGS WHEN TOO MANY ERRORS HAVE BEEN PRINTED FOR A BANK
1255 002474  000000                NOECCFLAG:0                     ;ECC CAPABILITY DISABLED ON THE CONTROL PANEL
1256 002476  000000                GDSWITCH:0                      ;GOOD VALUE FOR SOME SWITCHES
1257 002500  000000                BDSWITCH:0                      ;BAD VALUE FOR SOME SWITCHES
1258 002502  000000                WRITEONLY:0                     ;FLAG TO PATTERNS TO WRITE ONLY
1259 002504  000000                READONLY:0                      ;FLAG TO PATTERNS TO READ ONLY
1260 002506  000000                TESTADD:0                       ;THE ADDRESS TO RUN CSR TESTS ON
1261 002510  000000                ALLCPUS:0                       ;CPUBIT'S FOR ALL CPU'S PRESENT
1262 002512  000000                HIBANK: 0                       ;HIGHEST BANK OF MEMORY
1263 002514  000000                HIACBANK:       0                       ;1ST INACCESSABLE BANK OF MEMORY
1264 002516  000000                UNITOP: 0                       ;HIGHEST ACCESSABLE BANK OF MEMORY THRU UNIBUS MAP
1265 002520  000000                STOPOK: 0                       ;FLAG TO ALLOW STOPPING WITH SWITCH REGISTER
1266 002522  000000                APTCORE:0                       ;AMOUNT OF CORE MEMORY ACCORDING TO APT
1267 002524  000000                APTMOS: 0                       ;AMOUNT OF MOS MEMORY ACCORDING TO APT
1268 002526  000000                NOFSMODE:0                      ;FLAG TO DISABLE FIELD SERVICE MODE
1269 002530  000000                NOERROR:0                       ;"THIS IS NOT AN ERROR" FLAG
1270 002532  000000                LOADBANK:0                      ;BANK LOADERS ARE RELOCATED TO
1271 002534  000000                TEMP:   0                       ;USED FOR JUNK
1272 002536  000000                QUICK:  0                       ;QUICK STOP FLAG FOR APT POWER FAIL
1273 002540  000000                NOSCOPE:0                       ;"NO SCOPE LOOP ALLOWED" FLAG
```

```
1274 002542  000000  FSINFLAG:0   ;'FIELD SERVICE - NO INTERNAL INTERLEAVE'' FLAG
1275 002544  000000  APTSIZE:0    ;APT SIZING INFO FLAG
1276 002546  000000  FS7FLAG:0    ;TRUE WHEN IN FIELD SERVICE COMMAND 7
1277 002550  000000  KI0:     0   ;SAVED KIPAR0 TO PASS CORRECT VALUE TO SLAVE
1278 002552  000000  KI1:     0   ;SAVED KIPAR1 TO PASS CORRECT VALUE TO SLAVE
1279 002554  000000  KI2:     0   ;SAVED KIPAR2 TO PASS CORRECT VALUE TO SLAVE
1280 002556  000000  KI3:     0   ;SAVED KIPAR3 TO PASS CORRECT VALUE TO SLAVE
1281 002560  000000  KI4:     0   ;SAVED KIPAR4 TO PASS CORRECT VALUE TO SLAVE
1282 002562  000000  KI5:     0   ;SAVED KIPAR5 TO PASS CORRECT VALUE TO SLAVE
1283 002564  000000  KI6:     0   ;SAVED KIPAR6 TO PASS CORRECT VALUE TO SLAVE
1284 002566  000000  KI7:     0   ;SAVED KIPAR7 TO PASS CORRECT VALUE TO SLAVE
1285 002570  000000  SLAVERROR:0  ;SLAVE HAD AN ERROR FLAG
1286 002572  000000  HUNGMSB:0    ;USED FOR TIMES OVER 13 SECONDS
1287 002574  000000  HUNGTIME:0   ;TIME TO ALLOW THE SYSTEM TO BE HUNG (MAX    13. SEC)
1288 002576  000000  CONFGERROR:0 ;CONFIGURATION ERROR FLAG
1289 002600  000000  TWOCSRS:0    ;TO FLAG LOADCSR TRAP TO LOAD TWO CSR'S
1290 002602  000000  I:       0   ;USED FOR GENERAL PURPOSE INDEXING
1291 002604  000000  J:       0   ;USED FOR GENERAL PURPOSE INDEXING
```

```
                                        .SBTTL  MULTIPORT VARIABLES
                                ;MULTIPORT DIRECTORY
                                ;PORTDIR:MASTER IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
                                ;       SLAVE IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
                                ;       SLAVE IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
                                ;       SLAVE IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
1300 002606  000000  000000  000000  PORTDIR:.WORD   0,0,0,0
     002614  000000
1301 002616  000000  000000  000000  TASK:   .WORD   0,0,0,0
     002624  000000
1302 002626  000000  000000  000000  PTYFLAG:.WORD   0,0,0,0
     002634  000000
1303 002636  000000  000000  000000  PTYBUF: .WORD   0,0,0,0
     002644  000000
1304 002646  000000  000000  000000  PORTCOUNT:.WORD 0,0,0,0
     002654  000000
1305 002656  000000  000000  000000  SLFLAG: .WORD   0,0,0,0
     002664  000000
1306 002666  000000                  MINDEX: 0                       ;MASTER CPU'S INDEX # TO TABLES ABOVE
1307 002670  000000                  LOCK:   0                       ;MULTIPROCESSOR LOCK
1308 002672  000000                  ACK:    0                       ;ACKNOWLEDGE FLAG (USED FOR STARTING SLAVES)
1309 002674  000000                  MASWR:  0                       ;MASTER'S SWR
1310 002676  000000                  MDISPLAY:0                      ;MASTER CPU DISPLAY WHEN RUNNING MULTIPROCESSOR TESTS
1311 002700                          $CMTGE: ;*END OF COMMON TAGS
```

```
                                        .SBTTL  VARIABLES       INITIALIZED TO NON ZERO
002700  000001                  CACHK:  1                       ;CACHE CONSTANT (MOVED TO CONTRL TO TURN ON CACHE)
002702  000012                  ERRMAX: 10.                     ;MAX # OF ERRORS PER BANK WITH SW11
002704  000031                  SOBK:   25.                     ;SOB CONSTANT
002706  002000                  KSTACK: STACK                   ;STACK BEGINNING (USED TO KEEP SLAVES STACKS SEGREGATED)
002710  000001                  LOADHOME:1                      ;HOME BANK OF LOADERS
002712  177777                  WORST:  177777                  ;SET IF TESTING BANKS IN WORST FIRST MODE(1ST PASS)
002714  176543                  SEEDHI: 176543                  ;WORKING SEED HI (USED FOR RANDOM NUMBER GENERATOR)
002716  123456                  SEEDLO: 123456                  ;WORKING SEED LO (USED FOR RANDOM NUMBER GENERATOR)
002720  176543                  MSEEDH: 176543                  ;MASTER SEED HI (USED FOR RANDOM NUMBER GENERATOR)
002722  123456                  MSEEDL: 123456                  ;MASTER SEED LO (USED FOR RANDOM NUMBER GENERATOR)
002724  177777                  HEADER: 177777                  ;USED TO PRINT HEADINGS ONLY ONCE
002726  177777                  ONES:   177777                  ;FOR AID IN "MOV" INSTRUCTIONS
002730  000000                  SLAVES: 0                       ;# OF SLAVE CPU'S
002732  000000                  ONCE:   0                       ;FLAG FOR TYPING TITLE ONLY ONCE
002734  000003                  FLIPLOC:3                       ;COUNTER FOR FLIPING DATA ON WORST CASE NOISE TEST
002736  177500                  IISTACR:177500                  ;ADDRESS OF THE IIST ACR (WAS 166000)
002740  177502                  IISTADR:177502                  ;ADDRESS OF THE IIST ADR (WAS 166002)
002742  000260                  IISTVEC:260                     ;ADDRESS OF THE IIST VECTOR (WAS 170)
002744  052525                  SOFTPAT:52525                   ;PATTERN FOR SOFT ERROR BACKGROUND TESTS
002746  000000                  $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
002750  000000                  $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
002752  000000                  RESTART:0                       ;RESTART (START ADD 202) FLAG
002754  000000                  $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS
002756  000000                  NOIIST: 0                       ;NO IIST IS TO BE USED DURING MULTIPORT TESTS
002760  000000                  PWLOCK: 0                       ;MULTIPROCESSOR LOCK FOR POWER FAILURE

                                ;********************** NOTE THESE TWO LOCATIONS MUST STAY TOGETHER ************
002762  000377                  BAKPAT: .WORD   377             ;BACKGROUND PATTERN                              *
002764  177400                  SWAPAT: .WORD   177400          ;SWAPPED BAKPAT                                  *
                                ;*****************************************************************************

002766  177570                  SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
002770  177570                  DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
002772  177560                  $TKS:   177560                  ;;TTY KBD STATUS
002774  177562                  $TKB:   177562                  ;;TTY KBD BUFFER
002776  177564                  $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
003000  177566                  $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
003002     012                  $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
003003     207      377     377 $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
003006     000
003007     077                  $QUES:  .ASCII  /?/             ;;QUESTION MARK
003010     015                  $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
003011     012      000         $LF:    .ASCIZ  <12>            ;;LINE FEED
                                        .EVEN
003014  000000                  MULTIPORT:0                     ;MULTIPROCESSING FLAG
```

```
                                        .SBTTL  CONFIGURATION TABLE
                                ;CONFIG:FIRST 16K CONFIGURATION WORDS (3 EACH)
                                ;       2ND     16K CONFIGURATION WORDS (3 EACH)
                                ;       .......................
                                ;       167TH   16K CONFIGURATION WORDS (3 EACH)
                                ;
                                ;CONFIGURATION WORDS:
                                ;                       LOW:    BIT 0-2   INTERLEAVE FACTOR
                                ;                               BIT 3     EXTERNAL INTERLEAVE
                                ;                               BIT 4     MASTER CAN ACCESS (MEMORY EXISTS)
                                ;                               BIT 5     SLAVE #1 CAN ACCESS (SHARED)
                                ;                               BIT 6     SLAVE #2 CAN ACCESS (SHARED)
                                ;                               BIT 7     SLAVE #3 CAN ACCESS (SHARED)
                                ;                               BIT 8-10  BOX NUMBER (0-7)
                                ;                               BIT 11    ERRORS PRESENT
                                ;                               BIT 12    PROTECTED REGION OF A MK11 BOX
                                ;                               BIT 13-14 MEMORY TYPE;0=MJ11;1=MK11
                                ;                               BIT 15    PROTECTED (PROGRAM SPACE)
                                ;                       MED:    BIT 0-5   NOT USED
                                ;                               BIT 6-8   MK11 CSR ADDRESS
                                ;                               BIT 9-11  NOT USED
                                ;                               BIT 12    INTERNAL INTERLEAVE
                                ;                               BIT 13    'BACKGROUND PATTERN VALID'' FLAG
                                ;                               BIT 14    BANK SELECTED FOR TEST BY FIELD SERVICE MODE
                                ;                               BIT 15    LOADERS HOME BANK
                                ;                       HIGH:   BIT 0     INDICATES BANK IS ADDRESSED BY CSR 172100
                                ;                               BIT 1     INDICATES BANK IS ADDRESSED BY CSR 172104
                                ;                               BIT 2     INDICATES BANK IS ADDRESSED BY CSR 172110
                                ;                               BIT 3     INDICATES BANK IS ADDRESSED BY CSR 172114
                                ;                               BIT 4     INDICATES BANK IS ADDRESSED BY CSR 172120
                                ;                               BIT 5     INDICATES BANK IS ADDRESSED BY CSR 172124
                                ;                               BIT 6     INDICATES BANK IS ADDRESSED BY CSR 172130
                                ;                               BIT 7     INDICATES BANK IS ADDRESSED BY CSR 172134
                                ;                               BIT 8-15  NUMBER OF ERRORS
003016  000170                  CONFIG: .REPT   170
004336  000000  000000  000000  CONFIEND:.WORD  0,0,0,0,0,0     ;THESE WORDS SHOULD NEVER GET WRITTEN INTO
004344  000000  000000  000000
                                                                ;IF THEY DO THE PROGRAM IS OVERFLOWING IT'S
                                                                ;CONFIGURATION TABLE (SOFTWARE BUG)'
```

```
                                        .SBTTL  ********** MAIN **********
004352                          START:  SUBTST  <<INITIALIZE VARIABLES TO ZERO>>
                                ;*****************************************************************
                                ;*SUBTEST        INITIALIZE VARIABLES TO ZERO
                                ;*****************************************************************
004352                                  SET     ACK             ;ACKNOWLEDGE THAT I HAVE STARTED (IN CASE I'M A SLAVE)
004360  000005                         RESET
004362  013706  002706                  MOV     KSTACK,SP       ;;SETUP THE STACK POINTER
004366                                  IF MULTIPORT EQ ONES AND CPUBIT NE #MASTER
                                          ;WAIT FOR ACK TO CLEAR OR TIMEOUT & HALT
004406  005004                           CLR R4
004410                          1$:       IF ACK IS TRUE
004416  077404                             SOB R4,1$
004420  000000                  SHALT:     HALT                 ;THE MASTER WOULD NOT ALLOW THIS SLAVE TO PROCEED
004422                                    END ;OF IF ACK IS TRUE
004422  000137  005752                    JMP BEGIN
004426                                  END ;OF IF MULTIPORT
004426  012700  002000                  MOV     #$CMTAG,R0      ;;FIRST LOCATION TO BE CLEARED
004432  005020                  1$:     CLR     (R0)+           ;;CLEAR MEMORY LOCATION
004434  022700  002700                  CMP     #$CMTGE,R0      ;;DONE?
004440  001374                          BNE     1$              ;LOOP BACK IF NO
004442                                  SUBTST  <<CLEAR NON-PROGRAM SPACE>>
                                ;*****************************************************************
                                ;*SUBTEST        CLEAR NON-PROGRAM SPACE
                                ;*****************************************************************
                                        ;THIS ATTEMPS TO GET RID OF ANY PARITY ERRORS BY WRITING INTO
                                        ;EVERY LOCATION THAT IS NOT LOADED INTO BY THE PROGRAM OR ALLOCATED
                                        ;TO THE XXDP LOADERS
004442  012737  000004  002100          MOV     #4,NOPAR                ;PARITY ACTION = COUNT & IGNORE
004450  012700  001000                  MOV     #1000,R0
004454  012737  000015  177746          MOV     #15,CNTRL               ;DISABLE CACHE & ABORTS
004462  012720  000000          9$:     MOV     #0,(R0)+                ;CLEAR THE STACK AREA
004466  020027  002000                  CMP     R0,#STACK
004472  103773                          BLO     9$
004474  012700  117146                  MOV     #END+2,R0
004500  012720  000000          8$:     MOV     #0,(R0)+                ;CLEAR FROM THE END OF THE PROGRAM TO THE XXDP LOADE
004504  020027  137776                  CMP     R0,#157776-8192.
004510  103773                          BLO     8$
004512  005037  002100                  CLR     NOPAR                   ;RESTORE DEFAULT PARITY ACTION

004516  005237  002670                  INC     LOCK            ;ONLY ALLOW ONE CPU AT A TIME TO GO THRU HERE
004522                                  IF LOCK NE #1
004532  000000                  MHALT1:   HALT                          ;MULTIPLE MASTER CPU'S ARE RUNNING
004534  000776                            BR    MHALT1
004536                                  END ;OF IF LOCK
```

```
1443 004536                                     SUBTST  <<INITIALIZE VARIABLES TO NON ZERO>>
                                        ;*********************************************************************
                                        ;*SUBTEST       INITIALIZE VARIABLES TO NON ZERO
                                        ;*********************************************************************
1444 004536                                     SET     WORST
1445 004544  012737  000003  002734        MOV     #3,FLIPLOC
1446 004552                                     SET     HEADER
1447 004560  012737  176543  002720        MOV     #176543,MSEEDH
1448 004566  012737  123456  002722        MOV     #123456,MSEEDL
1449 004574  013737  002720  002714        MOV     MSEEDH,SEEDHI   ;PRIME THE RANDOM NUMBER GENERATOR
1450 004602  013737  002722  002716        MOV     MSEEDL,SEEDLO   ;BOTH HIGH AND LOW WORDS
1451 004610  012737  000377  002762        MOV     #377,BAKPAT
1452 004616  012737  177400  002764        MOV     #177400,SWAPAT
1453 004624  012737  052525  002744        MOV     #52525,SOFTPAT
1454 004632  012737  005752  002746        MOV     #BEGIN,$LPADR   ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
1455 004640  012737  005752  002750        MOV     #BEGIN,$LPERR   ;;SETUP THE ERROR LOOP ADDRESS
1456 004646                                     SUBTST  <<INITIALIZE VECTORS>>
                                        ;*********************************************************************
                                        ;*SUBTEST       INITIALIZE VECTORS
                                        ;*********************************************************************
1457 004646  012737  066232  000020        MOV     #$SCOPE,IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
1458 004654  012737  000340  000022        MOV     #340,IOTVEC+2   ;;LEVEL 7
1459 004662  012737  066662  000030        MOV     #$ERROR,EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
1460 004670  012737  000340  000032        MOV     #340,EMTVEC+2   ;;LEVEL 7
1461 004676  012737  075252  000034        MOV     #$TRAP,TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
1462 004704  012737  000340  000036        MOV     #340,TRAPVEC+2;LEVEL 7
1463 004712  012737  055160  000024        MOV     #$PWRDN,PWRVEC ;;POWER FAILURE VECTOR
1464 004720  012737  000340  000026        MOV     #340,PWRVEC+2   ;;LEVEL 7
1465 004726  012737  036454  000114        MOV     #PARITY,PARVEC;GET READY FOR PARITY ERRORS
1466 004734  012737  000340  000116        MOV     #340,PARVEC+2
1467 004742  012737  036752  000010        MOV     #PDP1105,RESVEC;RESERVED INSTRUCTION TRAP
1468 004750  012737  000340  000012        MOV     #340,RESVEC+2
1469 004756  012737  036726  000004        MOV     #TIMEOUT,ERRVEC;SETUP TIMEOUT ERRORS
1470 004764  012737  000340  000006        MOV     #340,ERRVEC+2   ;SET PRIORITY OF ERROR TRAPS
1471 004772  012737  036740  000250        MOV     #MMTRAP,MMVEC   ;VECTOR FOR MEMORY MANAGEMENT
1472 005000  012737  000340  000252        MOV     #340,MMVEC+2
1473 005006  012737  036764  000170        MOV     #IITRAP,170     ;SET UP FOR UNEXPECTED IIST TRAPS
1474 005014  012737  000340  000172        MOV     #340,172
1475 005022  104423                             CACHON                  ;TURN CACHE ON
```

```
1479 005024                                     SUBTST  <<CLEAR THE CONFIGURATION TABLE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CLEAR THE CONFIGURATION TABLE
                                        ;*****************************************************************************
1480                                    ;THIS ZEROS (UNLESS WE STARTED AT ADDRESS 202) THE CONFIG TABLE
1481                                    ;WHICH IS FULLY DISCRIBED AT LOCATION ''CONFIG''.
1482                                    .ENABLE LSB
1483 005024                            IF RESTART IS FALSE
1484 005032  012700  003016              MOV    #CONFIG,R0
1485 005036  005020              1$:     CLR    (R0)+
1486 005040  022700  004336              CMP    #CONFIEND,R0
1487 005044  001374                      BNE    1$
1488 005046                            END ;OF IF RESTART
1489                                    .DSABL  LSB
1490 005046  012737  000020  002114     MOV     #MASTER,CPUBIT          ;SET ID BIT
1491 005054                            SUBTST  <<SIZE FOR A HARDWARE SWITCH REGISTER>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SIZE FOR A HARDWARE SWITCH REGISTER
                                        ;*****************************************************************************
1492                                    ;;IF NOT FOUND OR IT IS
1493                                    ;;EQUAL TO A ''-1'', SETUP FOR A SOFTWARE SWITCH REGISTER.
1494                                    .ENABL  LSB
1495 005054                            SET4    #3$             ;TRAPS TO 4 GOTO 3$
1496 005062  012737  177570  002766     MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWITCH REGISTER
1497 005070  012737  177570  002770     MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
1498 005076                            IF #-1 EQ @SWR          ;IF NO TRAP FROM REFERENCE TO @SWR AND @SWR   #-1
1499 005106  000403                      BR     2$              ;;BRANCH IF NO TIMEOUT
1500 005110  012716  005116      3$:     MOV    #2$,(SP)        ;;SET UP FOR TRAP RETURN
1501 005114  000002                      RTI
1502 005116                      2$:     RES4                    ;RESET TRAPS TO 4 TO DEFAULT
1503 005130  012737  000176  002766       MOV   #SWREG,SWR      ;;POINT TO SOFTWARE SWR
1504 005136  012737  000174  002770       MOV   #DISPREG,DISPLAY
1505 005144                            END ;OF IF #-1
1506                                    .DSABL  LSB
1507
1508 005144                            SUBTST  <<FIND OUT IF ANY LINE CLOCK IS PRESENT>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FIND OUT IF ANY LINE CLOCK IS PRESENT
                                        ;*****************************************************************************
1509 005144                            SET4    #4$
1510 005152  005737  177546            TST     LKS
1511 005156  000403                    BR      5$              ;IF NO TRAP SKIP
1512 005160                      4$:   SET     NOCLOCK         ;SET NO LINE CLOCK FLAG
1513 005166                      5$:   RES4                    ;RESTORE TRAPS TO 4 TO DEFAULT
```

```
1516 005200                            SUBAAB: SUBTST  <<SETUP ACT, APT, & XXDP>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SETUP ACT, APT, & XXDP
                                       ;*****************************************************************************
1517                                           ;THIS SETS UP A BUNCH OF FLAGS TO TELL THE PROGRAM EVERYTHING
1518                                           ;IT CARES TO KNOW ABOUT APT, ACT, & XXDP.
1519 005200  005037  075142                    CLR     $PASS           ;CLEAR PASS COUNT
1520 005204                                    IFB #BIT5 SET.IN $ENVM
1521 005214                                      SET   $TPFLG          ;INDICATE NO TERMINAL
1522 005222                                    END ;OF IFB #BIT5
1523 005222                                    IFB #BIT7 SET.IN $ENVM
1524 005232                                      SET   APTSIZE
1525 005240  012737  075156  002766              MOV   #$SWREG,SWR     ;USE APT SWR
1526 005246                                    END ;OF IFB #BIT7
1527 005246                                    IFB $ENV EQ #1
1528 005256                                      SET   APTFLAG,QVFLAG,$AUTO,QUICK
1529 005306  012737  043640  000024              MOV   #APTDOWN,PWRVEC
1530 005314                                    ELSE
1531 005316                                      IF 42 NE #STACK AND 42 NE #0
1532 005334                                        SET QVFLAG,$AUTO
1533 005350                                        IF 42 EQ #$ENDAD
1534 005360                                          SET       ACTFLAG
1535 005366                                        ELSE
1536 005370                                          SET       XXDPCHAIN
1537 005376                                        END ;OF IF 42
1538 005376                                      END ;OF IF 42
1539 005376                                    END ;OF IFB $ENV
```

```
1542 005376                                     SUBTST  <<INITIALIZE PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        INITIALIZE PATTERNS
                                        ;*****************************************************************************
1543                                            ;THE APT E-TABLE DETERMINES WHICH PATTERNS ARE GOING TO BE RUN.
1544                                            ;EACH BIT SET REPRESENTS A PATTERN TABLE ENTRY THAT IS TO BE LEFT
1545                                            ;ALONE (TO BE RUN).  EACH BIT CLEARED REPRESENTS A PATTERN TABLE ENTRY
1546                                            ;THAT IS TO BE OVERLAYED WITH THE ADDRESS OF A NULL PATTERN.
1547 005376                                     IF APTFLAG IS TRUE
1548 005404  012700  075220                       MOV   #$DDW0,R0
1549 005410  012001                               MOV   (R0)+,R1
1550 005412  012703  020124                       MOV   #MKCSRT,R3
1551 005416  004737  005472                       CALL  PATPLUG
1552 005422  012001                               MOV   (R0)+,R1
1553 005424  004737  005472                       CALL  PATPLUG
1554 005430  012001                               MOV   (R0)+,R1
1555 005432  012703  021402                       MOV   #MKPAT,R3
1556 005436  004737  005472                       CALL  PATPLUG
1557 005442  012001                               MOV   (R0)+,R1
1558 005444  004737  005472                       CALL  PATPLUG
1559 005450  012001                               MOV   (R0)+,R1
1560 005452  012703  021600                       MOV   #MUPAT,R3
1561 005456  004737  005472                       CALL  PATPLUG
1562 005462  012001                               MOV   (R0)+,R1
1563 005464  004737  005472                       CALL  PATPLUG
1564 005470                                     END ;OF IF APTFLAG IS TRUE
1565 005470  000420                             BR      SUBAAA
1566
1567 005472                             PATPLUG:SUBTST  <<SUBR  PLUG IN NULL PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    PLUG IN NULL PATTERNS
                                        ;*****************************************************************************
1568 005472                                     FOR I := #1 TO #16.
1569 005500  006001                               ROR   R1
1570 005502                                       ON.NOERROR            ;IF CARRY CLEAR
1571 005504  012713  025772                         MOV #MT0999,(R3)
1572 005510                                       END ;OF ON.ERROR
1573 005510  062703  000002                       ADD #2,R3
1574 005514                                     END ;OF FOR
1575 005530  000207                             RETURN
```

```
1578 005532                            SUBAAA: SUBTST  <<PROTECT PROGRAM & LOADERS>>
                                       ;*************************************************************************
                                       ;*SUBTEST       PROTECT PROGRAM & LOADERS
                                       ;*************************************************************************
1579 005532  052737  100000  003016          BIS     #BIT15,CONFIG           ;PROTECT PROGRAM SPACE (BANK 0)
1580 005540  052737   00000  003024          BIS     #BIT15,CONFIG+6         ;PROTECT LOADER SPACE (BANK 1)
1581 005546                                   IF #$ENDAD NE 42 AND ONCE IS FALSE ;NOT ACT-11 AND NOT DONE ONCE?
1582 005564                                     TYPE  MSG000                  ;TYPE PROGRAM TITLE
1583 005570                                   END ;OF IF #$ENDAD
1584 005570                                   SUBTST  <<MULTIPORT DETERMINATION ROUTINE>>
                                       ;*************************************************************************
                                       ;*SUBTEST       MULTIPORT DETERMINATION ROUTINE
                                       ;*************************************************************************
1585                                          ;DETERMINE
1586                                          ;1. IF WE ARE MULTIPROCESSING
1587                                          ;2. IF WE CAN USE THE IIST INTERFACE
1588                                          ;3. EACH CPU'S ID (IIST NUMBER OR SYSTEM ID REGISTER)
1589                                          .ENABL  LSB
1590 005570                                   IF NOIIST IS TRUE
1591 005576                                     IF ONCE IS FALSE
1592 005604                            1$:        TYPE        MSG080           ;ENTER # OF SLAVE CPU'S (0-3)?
1593 005610  104413                             RDOCT                        ;READ AN OCTAL NUMBER ONTO THE STACK
1594 005612                                     POP SLAVES
1595 005616                                   END ;OF IF ONCE
1596 005616                                   IF SLAVES LT #0 OR SLAVES GT #3
1597 005634  000763                             BR  1$
1598 005636                                   END ;OF IF SLAVES
1599 005636                                   IF SLAVES EQ #0 THEN GOTO 2$
1600 005644  013737  177764  002606          MOV   SYSTID,PORTDIR
1601 005652                                 ELSE
1602 005654                                   SET4  #2$                     ;TRAPS TO 4 GOTO 2$
1603 005662  012777  100000  175046          MOV   #BIT15,@IISTACR         ;IS THERE AN IIST?
1604 005670  017700  175042                  MOV   @IISTACR,R0             ;YES - GET ID
1605 005674  072027  177770                  ASH   #-8.,R0
1606 005700  042700  177774                  BIC   #^C3,R0
1607 005704  010037  002606                  MOV   R0,PORTDIR              ;IDENTIFY MASTER
1608 005710  005777  175024                  TST   @IISTADR                ;SEE IF 2ND IIST REGISTER TRAPS
1609 005714                                 END ;OF IF NOIIST
1610 005714                                 SET     MULTIPORT             ;MULTIPORTING!
1611 005722  013706  002706          2$:    MOV     KSTACK,SP
1612 005726                                 RES4                          ;RESET TRAPS TO 4 TO DEFAULT
1613 005740                                 SET     ONCE
1614 005746  005037  002670                CLR     LOCK
1615                                        .DSABL  LSB
```

```
 16'8 005752                            BEGIN:  SUBTST  <<SLAVES START HERE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SLAVES START HERE
                                        ;*****************************************************************************
                                        ;
 1619 005752  000240                            NOP
 1620 005754  005237  002670                    INC     LOCK                ;ONLY ONE CPU AT A TIME IS ALLOWED HERE
 1621 005760                                    IF LOCK NE #1
 1622 005770  000000                    MHALT2:   HALT                              ;MULTIPLE CPU'S EXECUTING SAME CODE
 1623 005772  000776                              BR     MHALT2
 1624 005774                                    END ;OF IF LOCK
 1625 005774                                    IF CPUBIT NE #MASTER                ;IF I'M A SLAVE
 1626 006004  004737  061244                      CALL   SLAVEMAP
 1627 006010                                    END ;OF IF CPUBIT
```

```
                                        SUBTST  <<DETERMINE MK11 ACCESS METHOD>>
                                ;*******************************************************************************
                                ;*SUBTEST        DETERMINE MK11 ACCESS METHOD
                                ;*******************************************************************************
                                        ;DETERMINE HOW WE ACCESS THE MK11 CSR'S.
                                        ;IF I CAN'T ACCESS THE CSR'S NORMALLY THEN I ASSUME THAT I MUST
                                        ;RELOCATE THRU THE UNIBUS MAP SO I SET THE ''CSR'S RELOCATED'' FLAG (CSRREL)
                                        ;NOTE:  I DON'T REALLY KNOW AT THIS POINT IF THERE IS ANY MK11 MEMORY YET
                                        ;       I ONLY DETERMINE HOW I WILL HAVE TO ACCESS IT IF THERE IS ANY'
006010                                  SET4    #5$             ;TRAPS TO 4 GOTO 5$
006016  012700  000010                  MOV     #8.,R0                  ;TEST FOR 8 CSR'S
006022  012702  172100                  MOV     #MK11ADD,R2             ;R2 = CSR ADDRESS
006026  005712                  4$:     TST     (R2)                    ;ANSWER RO TRAP
006030  005037  002254                  CLR     CSRREL                  ;ANSWER - CSR'S NOT RELOCATED
006034  000410                          BR      6$                      ;BRANCH - OUT
006036  062706  000004          5$:     ADD     #4,SP                   ;FIX STACK FROM TRAP
006042  062702  000004                  ADD     #4,R2                   ;NEXT CSR = LAST CSR + 4
006046  077011                          SOB     R0,4$                   ;LOOP TILL DONE
006050                                  SET     CSRREL
006056                          6$:     RES4                    ;RESET TRAPS TO 4 TO DEFAULT
006070                                  SUBTST  <<SETUP USER & SUPERVISOR STACK>>
                                ;*******************************************************************************
                                ;*SUBTEST        SETUP USER & SUPERVISOR STACK
                                ;*******************************************************************************
006070  104421                          DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT

                                        ;SET PREVIOUS MODE TO SUPERVISOR
006072  042737  030000  177776          BIC     #BIT13!BIT12,PSW
006100  052737  010000  177776          BIS     #BIT12,PSW

006106                                  PUSH    #SUPSTK
006112  006606                          MTPI    SSP

                                        ;SET PREVIOUS MODE TO USER
006114  052737  030000  177776          BIS     #BIT13!BIT12,PSW

006122                                  PUSH    #USESTK
006126  006606                          MTPI    USP
```

```
                                        SUBTST  <<GET SOFTWARE SWITCH REGISTER IF NECESSARY>>
                                ;*******************************************************************************
                                ;*SUBTEST        GET SOFTWARE SWITCH REGISTER IF NECESSARY
                                ;*******************************************************************************
                                        IF CPUBIT EQ #MASTER AND $AUTO IS FALSE ;IF MASTER & NOT (APT OR ACT)
                                          IF SWR EQ #SWREG                      ;IF SOFTWARE SWITCH REG SELECTED
                                            GTSWR                                       ;;GET SOFT-SWR SETTINGS
                                          END ;OF IF SWR
                                        END ;OF IF CPUBIT

                                        MOV     #20,MMR3                ;SET 22 BIT MODE
                                        CLR     MAINT                   ;CLEAR MARGINS

                                        SUBTST  <<SETUP UNIBUS MAP>>
                                ;*******************************************************************************
                                ;*SUBTEST        SETUP UNIBUS MAP
                                ;*******************************************************************************
                                        MOV     #77,MAPH36              ;MAP36 IS USED TO ACCESS MK11 CSR'S ON PDP11-70'S
                                        MOV     #160000,MAPL36          ;THAT DO NOT HAVE THE MULTIPROCESSOR MODIFICATIONS.
                                        CLEAR   MAPH0,MAPL0             ;MAP0 IS USED FOR APT TO LOOK AT THE MAILBOX THRU.
                                        CALL    LOWMAP                  ;SETUP LOWER UNIBUS MAP
                                        BIS     #BIT5,MMR3              ;ENERGIZE UNIBUS MAP

                                        SUBTST  <<GET MEMORY MANAGEMENT READY>>
                                ;*******************************************************************************
                                ;*SUBTEST        GET MEMORY MANAGEMENT READY
                                ;*******************************************************************************
                                        IF CPUBIT EQ #MASTER
                                          KMAP                          ,MAP KERNEL SPACE 1 TO 1
                                        END ;OF IF CPUBIT
                                        MAP                             ;MAP SUPERVISOR SPACE (TEST AREA) 1 TO 1
                                        ENERGIZE                        ;TURN ON MEMORY MANAGEMENT
```

```
                                        NEWTST  <<ANALIZE CONFIGURATION>>
                                ;*****************************************************************************
                                ;*TEST 1         ANALIZE CONFIGURATION
                                ;*****************************************************************************
    006260  000004              TST1:   SCOPE
                                        ;THIS CODE DOES THE FOLLOWING FOR MK11 CSR'S
                                        ;1. FINDS ANY EXISTING CSR'S - SETTING BITS IN LOC 'MKCSRS' FOR
                                        ;   EACH ONE PRESENT.
                                        ;2. SETS A BIT IN LOC 'MKCSRS' FOR ANY MK11 THAT IS INTERNALLY INTERLEAVED
                                        ;3. DETERMINES THE INTERLEAVE FACTOR & STARTING ADDRESS.  USING THIS
                                        ;   WE DETERMINE THE FIRST & LAST BANK INCLUDED IN THIS CSR.  USING THAT
                                        ;   THE CONFIGURATION TABLE IS UPDATED TO
                                        ;       A. IDENTIFY BANKS WITHIN THE RANGE AS MK11 MEMORY.
                                        ;       B. IDENTIFY BANKS WITHIN THE RANGE WITH INTERLEAVE FACTOR.
                                        ;       C. IF NO EXTERNAL INTERLEAVE IDENTIFY BANKS WITHIN THE RANGE
                                        ;          AS CONTROLLED BY THIS CSR
                                        ;       D. IDENTIFY BANKS WITHIN THE RANGE BY A SPECIFIC BIT POSITION
                                        ;          FOR THIS CSR
006262  005037  002256                        CLR     CSRNO                   ;1ST CSR IS 0
006266                                      PUSH    CONTRL                  ;SAVE CACHE STATUS
006272                                      SET4    #CONFGT         ;TRAPS TO 4 GOTO CONFGT
006300  010637  006754                      MOV     SP,CONFSP               ;SAVE STACK
006304  006337  002334              CONFG1: ASL     MKCSRS
006310  006337  002330                      ASL     PENDBOX
006314  104426                            READCSR                         ;TRAP IF IT DOES NOT EXIST
006316  052737  000001  002334            BIS     #1,MKCSRS               ;MARK CSR AS PRESENT
006324  005001                            CLR     R1
006326  013700  002146                    MOV     CSR+2,R0
006332  072027  177765                    ASH     #-11.,R0
006336  042700  177770                    BIC     #^C7,R0
006342                                      IF #BIT0 SET.IN R0 THEN LET MKCSRS := MKCSRS SET.BY #BIT8
006356                                      CASE R0
006366  006756                                INTER0
006370  006760                                INTER1
006372  006760                                INTER2
006374  006766                                INTER3
006376  006766                                INTER4
006400  006774                                INTER5
006402  006766                                INTER6
006404  006774                                INTER7
006406                                      END ;OF CASE R0
006414  010137  002264                    MOV     R1,INTERL               ;SET INTERLEAVE FACTOR
006420  004737  017736                    CALL    GETSIZE
                                        ;THE NEXT 6 LINES SAVE THE READ STATUS OF THE BOX CAPACITY
006424  013701  002256                    MOV     CSRNO,R1
006430  006201                            ASR     R1
006432  013761  002144  002154            MOV     CSR,CSR0(R1)
006440  013761  002146  002174            MOV     CSR+2,CSR2(R1)
006446  013761  002260  002214            MOV     FIRSTB,CSRFB(R1)
006454                                      IF FIRSTB GT #167
006464  052737  000001  002330              BIS #BIT0,PENDBOX
006472  000137  006712                      JMP     CONFG5
006476                                      END ;OF IF FIRSTB
006476  013761  002262  002234            MOV     LASTB,CSRLB(R1)
006504  013701  002260                    MOV     FIRSTB,R1
006510  070127  000006                    MUL     #6,R1                   ;R1   BANK * 6
006514  010137  002110                    MOV     R1,BANKINDEX
```

```
 1742 006520  013701  002110          CONFG3: MOV     BANKINDEX,R1            ;GET NEXT INDEX (SAME FIRST TIME)
 1743 006524  053761  002264  003016          BIS     INTERL,CONFIG(R1)       ;SETUP INTERLEAVE BITS
 1744 006532  052761  020000  003016          BIS     #BIT13,CONFIG(R1)       ;IDENTIFY AS MK11
 1745 006540  042761  040000  003016          BIC     #BIT14,CONFIG(R1)
 1746 006546                                  IF #BIT8 SET.IN MKCSRS
 1747 006556  052761  010000  003020            BIS   #BIT12,CONFIG+2(R1)
 1748 006564                                  END ;OF IF #BIT8
 1749 006564  013700  002256                  MOV     CSRNO,R0                ;GET CSR LSB'S
 1750 006570  072027  177776                  ASH     #-2,R0                  ;MAKE (0-7)
 1751 006574                                  IF #BIT13!BIT12 SET.IN CSR+2    ;ANY EXTERNAL INTERLEAVE?
 1752 006604  052761  000010  003016            BIS   #BIT3,CONFIG(R1)        ;IDENTIFY IT
 1753 006612                                  ELSE
 1754 006614                                    PUSH  R0
 1755 006616  072027  000010                    ASH   #8.,R0                  ;MOVE TO BITS 10-8
 1756 006622  050061  003016                    BIS   R0,CONFIG(R1)           ;IDENTIFY AS CSR & BOX NUMBER
 1757 006626                                    POP   R0
 1758 006630                                  END ;OF IF #BIT13!BIT12
 1759 006630  012702  000001                  MOV     #1,R2
 1760 006634  072200                          ASH     R0,R2                   ;R2 = 1,2,4,10,20,40,100, OR 200
 1761 006636  050261  003022                  BIS     R2,CONFIG+4(R1)         ;SETUP CSR WORD
 1762 006642  062737  000006  002110          ADD     #6,BANKINDEX            ;NEXT TABLE ENTRY
 1763 006650  005237  002260                  INC     FIRSTB
 1764 006654  023737  002260  002262          CMP     FIRSTB,LASTB            ;DONE?
 1765 006662  101716                          BLOS    CONFG3                  ;NO - LOOP
 1766 006664  000412                          BR      CONFG5
 1767 006666  013706  006754          CONFGT: MOV     CONFSP,SP               ;FIX STACK FROM MULTIPLE TRAP
 1768 006672                                  IF #BIT4 OFF.IN CPUERR
 1769 006702                                    LET GOOD := #BIT4
 1770 006710  104037                            ERROR +37
 1771 006712                                  END ;OF IF CPUERR
 1772 006712  062737  000004  002256  CONFG5: ADD     #4,CSRNO                ;BUMP CSR
 1773 006720                                  IF CSRNO NE #40 THEN JUMPTO CONFG1
 1774 006734                                  RES4                            ;RESET TRAPS TO 4 TO DEFAULT
 1775 006746                                  POP     CONTRL                  ;RESTORE CACHE STATUS
 1776 006752  000413                          BR      SUBAAS
 1777 006754  000000                  CONFSP: 0                               ;STACK SAVED HERE!
 1778
 1779                                         ;TOTAL INTERLEAVE (0, 2-1, 4-1, OR 8-1)
 1780 006756  000207                  INTER0: RETURN                          ;NO INTERLEAVE
 1781
 1782 006760                          INTER1:
 1783 006760  012701  000001          INTER2: MOV     #1,R1                   ;2 WAY INTERLEAVE
 1784 006764  000207                          RETURN
 1785
 1786 006766                          INTER3:
 1787 006766                          INTER4:
 1788 006766  012701  000002          INTER6: MOV     #2,R1                   ;4 WAY INTERLEAVE
 1789 006772  000207                          RETURN
 1790
 1791 006774                          INTER5:
 1792 006774  012701  000004          INTER7: MOV     #4,R1                   ;8 WAY INTERLEAVE
 1793 007000  000207                          RETURN
```

```
                                SUBAAS: ECCINIT          ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
                                        NEWTST  <<TEST BANK 0 ACCESSES>>
                                ;*********************************************************************************
                                ;*TEST 2         TEST BANK 0 ACCESSES
                                ;*********************************************************************************
                                TST2:   SCOPE
                                        ;THIS DOES A "TST" INSTRUCTION ON EVERY LOCATION IN BANK #0 TO SEE
                                        ;IF IT GETS ANY PARITY TRAPS.
                                        ;SINCE EVERY LOCATION IS EITHOR LOADED OR WRITTEN INTO BY THE PROGRAM
                                        ;PRIOR TO THIS POINT - THEN A PARITY ERROR IMPLIES THAT THERE IS A
                                        ;HARDWARE FAILURE IN THE MEMORY.
                                        ;THESE ERRORS ARE COUNTED AND A FATAL ACTION IS TAKEN
007006  005037  002074                  CLR     PARCNT                  ;CLEAR PARITY ERROR COUNTER
007012  012737  000001  002100          MOV     #1,NOPAR                ;SET THE NO PARITY ERROR FLAG
007020  005037  002072                  CLR     NEMCNT                  ;CLEAR NON-EXISTANT MEMORY ERROR COUNTER
007024  012737  000001  002102          MOV     #1,NONEM                ;SET THE NON-EXISTANT MEMORY ERROR MODE TO COUNT
007032                                  SET4    #NONEXIST       ;TRAPS TO 4 GOTO NONEXIST
007040  005000                          CLR     R0
007042  012701  040000                  MOV     #SIZE,R1
007046  104424                          CACHOFF                 ;TURN CACHE OFF
007050  005720                  1$:     TST     (R0)+                   ;SEE IF I CAN DO A READ ACCESS WITHOUT A PARITY TRAP
007052  077102                          SOB     R1,1$
007054  104423                          CACHON                  ;TURN CACHE ON
                                        ;SEE IF ANY FAILURES
007056  005737  002074                  TST     PARCNT                  ;ANY PARITY ERRORS?
007062  001403                          BEQ     2$                      ;NO - SKIP
007064                                  FATAL   3
007072  005737  002072          2$:     TST     NEMCNT                  ;ANY NON-EXISTANT MEMORY (HOLES)?
007076  001406                          BEQ     3$                      ;SKIP IF EQUAL
007100  162737  000002  002040          SUB     #2,ADDRESS              ;UPDATE 1ST ADDRESS FAILURE FROM AUTO INCREMENT #
007106                                  FATAL   4
007114  053737  002114  003016  3$:     BIS     CPUBIT,CONFIG           ;SET CORRECT ACCESSED BIT ON BANK 0
007122                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT

007134                                  SUBTST  <<ENABLE MK11 FOR CORRECT TRAPS>>
                                ;*********************************************************************************
                                ;*SUBTEST        ENABLE MK11 FOR CORRECT TRAPS
                                ;*********************************************************************************
007134                                  IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
007152  104506                            ENASBE                  ;TRAP ON SINGLE BIT ERRORS
007154                                  ELSE
007156  104472                            ECCINIT                 ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
007160                                  END ;OF IF #SW0
```

```
1833 007160                                    NEWTST  <<TEST BANKS 1-167 (OCTAL) FOR ZEROS & ONES>>
                                       ;*****************************************************************************
                                       ;*TEST 3        TEST BANKS 1-167 (OCTAL) FOR ZEROS & ONES
                                       ;*****************************************************************************
     007160  000004                    TST3:   SCOPE
1834                                           ;EACH BANK IS TESTED FOR EXISTANCE AND IF IT EXISTS
1835                                           ;THEN IS IS TESTED FOR ZEROS & ONES.
1836                                           ;EXCEPT -
1837                                           ;       PROTECTED BANKS (WHERE THE PROGRAM IS) ARE ONLY TESTED BY
1838                                           ;       "TST" INSTRUCTIONS LIKE BANK #0
1839                                           ;ANY BAD BANKS ARE LOGGED IN THE CONFIGURATION TABLE.
1840                                           ;ANY ERROR HERE WILL FORCE THE CONFIGURATION TABLE TYPEOUT'
1841                                           ;THIS ROUTINE IS ONLY DOING A SMART SIZE - NOT ACTUAL TESTING
1842 007162  005037  002106                   CLR     BANK
1843 007166  012737  000001  002100           MOV     #1,NOPAR                ;SET NO PARITY ERROR FLAG
1844 007174  012737  000002  002102           MOV     #2,NONEM                ;SET NON-EXISTANT MEMORY MODE TO EXIT TEST LOOP
1845 007202                                    SET4    #NONEXIST       ;TRAPS TO 4 GOTO NONEXIST
1846 007210                                    BMOV    MTP000                  ;PUT IN FAST MEMORY
1847 007216  012737  005237  177654           MOV     #005237,UIPAR6  ;PUT "INC " INSTRUCTION IN SUBROUTINE
1848 007224  012737  002076  177656           MOV     #PATERR,UIPAR7  ;PUT IN ADDRESS OF OPERAND FOR ABOVE
1849 007232  005237  002106           TAG9$:  INC     BANK
1850 007236  022737  000170  002106           CMP     #120.,BANK              ;DONE?
1851 007244  001450                           BEQ     TAG2$                   ;YES - SKIP TO NEXT TEST
1852 007246  013701  002106                   MOV     BANK,R1
1853 007252  070127  000006                   MUL     #6,R1                   ;BANK*3*2
1854 007256  010137  002110                   MOV     R1,BANKINDEX
1855 007262  005037  002076                   CLR     PATERR                  ;CLEAR PATTERN ERROR COUNTER
1856 007266  005037  002074                   CLR     PARCNT                  ;CLEAR PARITY ERROR COUNTER
1857 007272  005037  002072                   CLR     NEMCNT                  ;CLEAR NON-EXISTANT MEMORY COUNTER (HOLES)
1858 007276                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
1859 007312  005761  003016                   TST     CONFIG(R1)              ;IS THIS BANK PROTECTED?
1860 007316  100533                           BMI     TSTBANK                 ;YES - GO TEST BANK SPECIAL
1861 007320  012737  000207  177644  WARN1:   MOV     #207,UIPAR2             ;PUT "RETURN" INSTRUCTION AFTER WRITE ROUTINE
1862 007326  012700  060000                   MOV     #FIRST,R0
1863 007332  010004                           MOV     R0,R4
1864 007334  012701  040000                   MOV     #SIZE,R1
1865 007340  010103                           MOV     R1,R3
1866 007342  005002                           CLR     R2                      ;DATA IS ZEROS
1867 007344  104424                           CACHOFF                 ;TURN CACHE OFF
1868 007346                                    SUPERVISOR                      ;ENTER SUPERVISOR MODE
1869 007354  004737  177640                   CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
1870 007360  104417                           KERNEL                  ;ENTER KERNEL MODE
1871 007362  104423                           CACHON                  ;TURN CACHE ON
1872 007364  000412                           BR      TAG3$                   ;SKIP NEXT INSTRUCTION
1873 007366  005037  00210E           TAG2$:  CLR     BANK
1874 007372                                    RES4                    ;RESET TRAPS TO 4 TO DEFAULT
1875 007404  005037  002100                   CLR     NOPAR                   ;INDICATE DEFAULT PARITY ACTION
1876 007410  000543                           BR      SUBAA0
1877 007412  005737  002072           TAG3$:  TST     NEMCNT                  ;ANY TRAPS?
1878 007416  001401                           BEQ     1$                      ;NO - SKIP
1879 007420  000704                           BR      TAC9$                   ;NOW - TRY NEXT BANK
1880 007422  104424                   1$:     CACHOFF                 ;TURN CACHE OFF
1881 007424                                    SUPERVISOR                      ;ENTER SUPERVISOR MODE
1882 007432  004737  177646                   CALL    UIPAR3                  ;FINISH PATTERN
1883 007436  104417                           KERNEL          ;ENTER KERNEL MODE
1884 007440  104423                           CACHON                  ;TURN CACHE ON
1885 007442  005737  002076                   TST     PATERR                  ;ANY PATTERN ERRORS
```

```
1886 007446 001031                          BNE     2$                      ;YES - SKIP
1887 007450 005737 002074                   TST     PARCNT                  ;ANY PARITY ERRORS
1888 007454 001026                          BNE     2$                      ;YES - SKIP
1889 007456 005737 002072                   TST     NEMCNT                  ;ANY NON EXISTANT MEMORY
1890 007462 001023                          BNE     2$                      ;YES - SKIP
1891 007464 012700 060000                   MOV     #FIRST,R0
1892 007470 010004                          MOV     R0,R4
1893 007472 012701 040000                   MOV     #SIZE,R1
1894 007476 010103                          MOV     R1,R3
1895 007500 013702 002726                   MOV     ONES,R2                 ;DATA IS ONES
1896 007504 012737 000240 177644            MOV     #000240,UIPAR2          ;PUT 'NOP'' INSTRUCTION BACK IN SUBROUTINE
1897 007512 104424                          CACHOFF                 ;TURN CACHE OFF
1898 007514                                 SUPERVISOR                      ;ENTER SUPERVISOR MODE
1899 007522 004737 177640                   CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
1900 007526 104417                          KERNEL          ;ENTER KERNEL MODE
1901 007530 104423                          CACHON                  ;TURN CACHE ON
1902 007532 013700 002110           2$:     MOV     BANKINDEX,R0
1903 007536 005737 002076                   TST     PATERR                  ;ANY PATTERN ERRORS?
1904 007542 001006                          BNE     3$                      ;YES - SKIP
1905 007544 005737 002074                   TST     PARCNT                  ;ANY PARITY ERRORS?
1906 007550 001003                          BNE     3$                      ;YES - SKIP
1907 007552 005737 002072                   TST     NEMCNT                  ;ANY HOLES?
1908 007556 001406                          BEQ     4$                      ;NONE - SKIP
1909 007560 052760 004000 003016    3$:     BIS     #BIT11,CONFIG(R0)       ;SET ERROR BIT IN THIS BANK
1910 007566                                 SET     CONFGERROR              ;FORCE PRINTING OF CONFIGURATION TABLE
1911 007574 053760 002114 003016    4$:     BIS     CPUBIT,CONFIG(R0)       ;SET ACCESSED BIT
1912 007602 000137 007232                   JMP     TAG9$
1913
1914                                        ;TEST A PROTECTED BANK
1915 007606                         TSTBANK:PUSH    R1
1916 007610 012737 000001 002102            MOV     #1,NONEM                ;SET NON-EXISTANT MEMORY TO COUNT
1917 007616 012700 060000                   MOV     #FIRST,R0
1918 007622 012701 040000                   MOV     #SIZE,R1
1919 007626 104424                          CACHOFF                 ;TURN CACHE OFF
1920 007630                                 SUPERVISOR              ;ENTER SUPERVISOR MODE
1921 007636 005720                  4$:     TST     (R0)+
1922 007640 077102                          SOB     R1,4$
1923 007642 104417                          KERNEL                  ;ENTER KERNEL MODE
1924 007644 104423                          CACHON                  ;TURN CACHE ON
1925 007646 012737 000002 002102            MOV     #2,NONEM                ;RESET NON-EXISTANT MEMORY TO EXIT TEST LOOP
1926 007654                                 POP     R1
1927 007656                                 IF PARCNT NE #0
1928 007664 052761 004000 003016              BIS   #BIT11,CONFIG(R1)       ;ERROR BANK
1929 007672                                   SET   CONFGERROR              ;FORCE PRINTING OF CONFIGURATION TABLE
1930 007700                                 END ;OF IF PARCNT
1931 007700                                 IF NEMCNT EQ #0
1932 007706 053761 002114 003016              BIS   CPUBIT,CONFIG(R1)       ;ACCESSED BANK
1933 007714                                 END ;OF IF NEMCNT
1934 007714 000137 007232                   JMP     TAG9$
```

```
1937 007720                          SUBAAQ: SUBTST  <<DETERMINE PROTECTED BANKS>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       DETERMINE PROTECTED BANKS
                                     ;*****************************************************************************
1938                                         ;THE MK11 INHIBITS ECC DISABLE (AND OTHER THINGS) ON THE BOTTOM
1939                                         ;16K WORDS OF EACH CONTROLLER (2 PER BOX).
1940                                         ;THIS IS CONSIDERED TO BE A PROTECTED BANK BY THE PROGRAM.
1941                                         ;USUALLY (ON A SINGLE BOX SYSTEM WITH 4K MOS RAMS) THIS IS BANKS #0 & #2
1942                                         ;HOWEVER IT MAY BE QUITE COMPLEX TO DETERMINE ON A GIVEN SYSTEM
1943                                         ;CONFIGURATION (MIXED MK11,MJ11;  MIXED 4K MOS, 16K MOS;  MULTIPLE MK11
1944                                         ;BOXES;  MIXED INTERLEAVE SCHEMES) WHICH BANKS ARE PROTECTED.
1945                                         ;SO
1946                                         ;THIS ROUTINE ATTEMPS TO CREATE A DOUBLE BIT ERROR IN ADDRESS #0 & #2
1947                                         ;OF EVERY MK11 BANK.  MK11 HARDWARE WILL PREVENT THIS FROM HAPPENING
1948                                         ;IN PROTECTED BANKS WHICH SHOULD ALWAYS INCLUDE BANK ZERO - WHERE THE
1949                                         ;PROGRAM IS.
1950                                         ;
1951                                         ;WARNING:!!!!!!!!!
1952                                         ;  IN CASE OF HARDWARE FAILURE IT IS COMMON THAT A DOUBLE BIT ERROR
1953                                         ;  WILL BE CREATED ON THE KERNEL STACK & ''CRASH'' THE DIAGNOSTIC DURING
1954                                         ;  THIS ROUTINE.  YOUR ONLY CLUE IS THAT YOU CAN GET AS FAR AS THIS
1955                                         ;  ROUTINE BUT NOT PAST IT!
1956 00772C  000004                  SCOPE
1957 007722  104424                  CACHOFF                    ;TURN CACHE OFF
1958 007724  005037  002122          CLR     KPFLAG
1959 007730  012701  060000          MOV     #FIRST,R1
1960 007734  005004                  CLR     R4
1961 007736                          FOR BANK := #0 TO #167
1962 007742  013703  002106            MOV   BANK,R3
1963 007746  070327  000006            MUL   #6,R3
1964 007752  010337  002110            MOV   R3,BANKINDEX
1965 007756                            IF CPUBIT SET.IN CONFIG(R3) ;IF ACCESSABLE
1966 007766                              IF #BIT13 SET.IN CONFIG(R3) AND #BIT14 OFF.IN CONFIG(R3) ;IF MK11
1967 010006                                MAP BANK                ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
1968 010022  005037  002144                CLR     CSR
1969 010026                                SUPERVISOR              ;ENTER SUPERVISOR MODE
1970 010034                                PUSH    FIRST,FIRST+2   ;SAVE TWO TEST LOCATIONS
1971 010044  104504                        CHKDIS                  ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
1972 010046  010411                        MOV     R4,(R1)                 ;WRITE CHECKBITS (ALL ZEROS)
1973 010050  010461  000002                MOV     R4,2(R1)
1974 010054  104502                        CLRCSR                  ;CLEAR MK11 CSRS
1975 010056  005711                        TST     (R1)                    ;READ CHECKBITS INTO REAL CSR
1976 010060  104500                        WASDBE                  ;WAS THERE A DOUBLE BIT ERROR
1977                                       ;THIS MAKES SURE THAT SBE'S DON'T LOOK LIKE PROTECTED AREAS
1978 010062                                ON.NOERROR ;1
1979 010064  005037  002144                  CLR     CSR
1980 010070  104504                          CHKDIS                ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
1981 010072  013711  002726                  MOV     ONES,(R1)
1982 010076  013761  002726  000002          MOV     ONES,2(R1)
1983 010104  104502                          CLRCSR                ;CLEAR MK11 CSRS
1984 010106  005711                          TST     (R1)
1985 010110  104500                          WASDBE                ;WAS THERE A DOUBLE BIT ERROR
1986 010112                                  ON.NOERROR ;2
1987 010114  012737  007400  002144            MOV   #7400,CSR
1988 010122  104504                            CHKDIS                      ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'
1989 010124  010411                            MOV   R4,(R1)
1990 010126  010461  000002                    MOV   R4,2(R1)
```

DETERMINE PROTECTED BANKS

```
1991 010132  104502                          CLRCSR                          ;CLEAR MK11 CSRS
1992 010134  005711                          TST   (R1)
1993 010136  104500                          WASDBE                          ;WAS THERE A DOUBLE BIT ERROR
1994 010140                                  ON.NOERROR ;3
1995 010142  012737  074000  002144            MOV #74000,CSR
1996 010150  104504                          CHKDIS                          ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'
1997 010152  010411                          MOV R4,(R1)
1998 010154  010461  000002                  MOV R4,2(R1)
1999 010160  104502                          CLRCSR                          ;CLEAR MK11 CSRS
2000 010162  005711                          TST (R1)
2001 010164  104500                          WASDBE                          ;WAS THERE A DOUBLE BIT ERROR
2002 010166                                  END ;OF ON.NOERROR ;3
2003 010166                                END ;OF ON.NOERROR ;2
2004 010166                              END ;OF ON.NOERROR ;1
2005 010166                              ON.NOERROR
2006                                       ;MARK PROTECTED BANK
2007 010170  013703  002110                MOV     BANKINDEX,R3
2008 010174  052763  010000  003016        BIS     #BIT12,CONFIG(R3)       ;IDENTIFY AS PROTECTED BY MK11
2009 010202                              END ;OF ON.NOERROR
2010 010202  104470                      ECCDIS                          ;DISABLE ERROR CORRECTION
2011 010204  010411                      MOV     R4,(R1)                 ;CLEAR OUT DOUBLE BIT ERROR
2012 010206  010461  000002              MOV     R4,2(R1)                ;CLEAR OUT DOUBLE BIT ERROR
2013 010212  104502                      CLRCSR
2014 010214                              POP     FIRST+2,FIRST           ;RESTORE TWO TEST LOCATIONS
2015 010224  104417                      KERNEL                          ;ENTER KERNEL MODE
2016 010226                            END ;OF IF #BIT3
2017 010226                          END ;OF IF CPUBIT
2018 010226                        END ;OF FOR BANK
2019 010242                        MAP                     ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
2020 010256  005037  002106        CLR     BANK
2021
2022 010262                        IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
2023 010300  104506                  ENASBE                ;TRAP ON SINGLE BIT ERRORS
2024 010302                        ELSE
2025 010304  104472                  ECCINIT               ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
2026 010306                        END ;OF IF #SW0
2027
2028 010306  104425                CACHON                  ;TURN CACHE ON
```

```
2031 010310                             NEWTST  <<MK11 PROTECTION POINTER TEST>>
                                ;*****************************************************************************
                                ;*TEST 4         MK11 PROTECTION POINTER TEST
                                ;*****************************************************************************
     010310  000004             TST4:   SCOPE
2032                                    ;INSURE THAT BOTTOM OF MK11 WAS PROTECTED WITH PROTECTION POINTER CLEAR
2033 010312                             BEGIN PROTECTIONTEST
2034 010312                             FOR BANK := #0 TO #167
2035 010316  004737  042422               CALL EXBANK
2036 010322                               IF MKFLAG IS TRUE AND ACFLAG IS TRUE
2037 010336                                 IF KPFLAG IS FALSE
2038 010344  104040                          ERROR      +40      ;MK11 PROTECTION POINTER FAILURE - DID NOT PROTECT BANK
2039 010346                                 END ;OF IF KPFLAG
2040 010346                                 LEAVE PROTECTIONTEST
2041 010350                               END ;OF IF MKFLAG
2042 010350                             END ;OF FOR BANK
2043 010364                             END PROTECTIONTEST
```

```
2046 010364                             SUBTST  <<CHECK SYSTEM SIZE REGISTER>>
                                ;*********************************************************************
                                ;*SUBTEST        CHECK SYSTEM SIZE REGISTER
                                ;*********************************************************************
2047                            ;THIS CHECKS THE SYSTEM SIZE REGISTER TO INSURE IT IS CORRECT
2048                            ;AND PROGRAMS ANY MK11 BOXES ON LINE THAT ARE NOT INHIBITED.
2049                            ;
2050                            ;NOTE: IF THE SYSTEM SIZE REGISTER IS SET TO INDICATE A VERY SMALL
2051                            ;        MEMORY THE PROGRAM MAY NOT BE ABLE TO FUNCTION.
2052                            ;      IF THE MK11 BOX STARTING ADDRESS LOGIC MALFUNCTIONS THE PROGRAM
2053                            ;        WILL EITHOR CRASH BECAUSE OF DUAL ADDRESSING PROBLEMS OR
2054                            ;        WILL HAVE HOLES IN MEMORY (NON-EXISTANT BANKS).
2055                            ;
2056                            ;THE TEST FUNCTIONS AS FOLLOWS
2057                            ;
2058                            ;1. THE PROGRAM CHECKS FOR MEMORY ON 16K WORD (BANK) BOUNDRIES
2059                            ;   THRU THE UNIBUS MAP (SO THAT THE SYSTEM SIZE REGISTER IS BYPASSED).
2060                            ;   LOCATION 'UNITOP' IS ASSIGNED THE NUMBER OF THE LAST BANK THAT WAS
2061                            ;   ACCESSABLE VIA THE UNIBUS MAP.
2062                            ;
2063                            ;2. LOCATION 'HIBANK' IS SET TO THE HIGHEST BANK THAT IS EITHOR
2064                            ;   (1) DIRECTLY ACCESSABLE VIA THE MEMORY BUS OR
2065                            ;   (2) AN MK11 CSR CLAIMS THAT IT EXISTS.
2066                            ;
2067                            ;3. LOCATION 'HIACBANK' IS ASSIGNED THE NUMBER OF THE HIGHEST BANK
2068                            ;   THAT IS DIRECTLY ACCESSABLE VIA THE MEMORY BUS.
2069                            ;
2070                            ;4. IF THE HIGHEST ACCESSABLE BANK IS LESS THAN #170
2071                            ;     IF ANY BOX STARTING ADDRESSES WERE ABOVE BANK #167
2072                            ;       TRY TO PROGRAM THE STARTING ADDRESS OF THE PENDING BOX
2073                            ;       IF IT DOES PROGRAM DOWN AND THEREFORE ADD MEMORY TO THE SYSTEM
2074                            ;         RESTART THE PROGRAM
2075                            ;     NEXT PENDING BOX
2076                            ;
2077                            ;5. R0 IS SET TO THE HIGHEST BANK NUMBER OF HIBANK OR UNITOP
2078                            ;
2079                            ;6. IF THE SYSTEM SIZE REGISTER DOES NOT EQUAL R0'S BANK THEN PRINT THE ERROR
```

```
2082
2083 010364  104424                          ;FIND UNITOP
2084 010366  005037  170372                  CACHOFF                 ;TURN CACHE OFF
2085 010372  012737  100000  170370          CLR     MAPH36          ;SET MAP TO BANK 1
2086 010400                                  MOV     #100000,MAPL36
2087 010406  012737  000004  002100          SET4    #2$             ;TRAPS TO 4 GOTO 2$
2088 010414  012700  140000                  MOV     #4,NOPAR        ;PARITY ACTION = COUNT & IGNORE
2089 010420  005710                  1$:     MOV     #140000,R0      ;PAR6 SELECTED
2090 010422  062737  100000  170370          TST     (R0)            ;TRAP IF NON-EXISTANT
2091 010430  005537  170372                  ADD     #100000,MAPL36  ;BUMP 1 BANK
2092 010434  022737  000073  170372          ADC     MAPH36
2093 010442  001366                          CMP     #73,MAPH36      ;INTO 128K SHADOW MEMORY?
2094 010444  000402                          BNE     1$              ;NO - LOOP
2095 010446  062706  000004          2$:     BR      3$
2096 010452  162737  100000  170370  3$:     ADD     #4,SP           ;FIX STACK FROM TRAP
2097 010460  005637  170372                  SUB     #100000,MAPL36
2098 010464                                  SBC     MAPH36
2099 010476  005037  002100                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
2100 010502  006137  170370                  CLR     NOPAR           ;RESTORE DEFAULT PARITY ACTION
2101 010506  006137  170372                  ROL     MAPL36
2102 010512  013737  170372  002516          ROL     MAPH36
2103                                         MOV     MAPH36,UNITOP
2104
2105 010520  012737  000077  170372          ;FIND HIBANK
2106 010526  012737  160000  170370          MOV     #77,MAPH36      ;RESTORE MAP36
2107 010534  104423                          MOV     #160000,MAPL36
2108 010536                                  CACHON                  ;TURN CACHE ON
2109 010542  012737  000003  002730          PUSH    SLAVES
2110 010550                                  MOV     #3,SLAVES       ;FAKE OUT THE EXBANK ROUTINE
2111 010550                                  BEGIN MEMSIZELOOP
2112 010554  004737  042422                    FOR BANK := #0 TO #167
2113 010560                                      CALL        EXBANK
2114 010574                                      IF ACFLAG IS FALSE AND MKFLAG IS FALSE
2115 010576                                        LEAVE MEMSIZELOOP
2116 010576                                      END ;OF IF ACFLAG
2117 010612                                    END ;OF FOR BANK
2118 010612  013700  002106                  END MEMSIZELOOP
2119 010616  005300                          MOV     BANK,R0
2120 010620  010037  002512                  DEC     R0
                                             MOV     R0,HIBANK
```

```
2123
2124 010624                                    ;FIND HIACBANK
2125 010634                                    CLEAR   BANK,HIACBANK
2126 010642                                    SET     ACFLAG
2127 010660  005237  002106                    WHILE ACFLAG IS TRUE AND BANK LT #167
2128 010664  004737  042422                      INC   BANK
2129 010670                                      CALL  EXBANK
2130 010672                                    END ;OF WHILE ACFLAG
2131 010676  013737  002106  002514            POP     SLAVES                  ;RESTORE FROM FAKE OUT
2132                                           MOV     BANK,HIACBANK
2133
2134                                           ;PROGRAM ON ANY BOXES  SETUP FOR ALLOW PROGRAM
2135 010704                                    ;& HI (100) STARTING ADDRESSES
2136 010714                                    IF HIACBANK LT #170
2137 010722  013701  002330                      IF PENDBOX IS TRUE
2138 010726                                        MOV PENDBOX,R1
2139 010732  106301                               FOR CSRNO := #0 TO #34 BY #4
2140 010734                                          ASLB    R1
2141 010736                                          ON.ERROR
2142 010744  012737  000001  002144                    SET     TWOCSRS
2143 010752  013737  002514  002146                    MOV     #1,CSR
2144 010760  000241                                    MOV     HIACBANK,CSR+2
2145 010762  006037  002146                            CLC
2146 010766  005537  002146                            ROR     CSR+2
2147 010772  052737  002000  002146                    ADC     CSR+2           ;IF NOT 32K WORD BOUND LEAVE A WHOLE IN MEM
2148 011000  104425                                    BIS     #BIT10,CSR+2    ;LOAD START ADD & INTERLEAVE BIT
2149 011002                                            LOADCSR
2150 011016  012737  000010  002144                    CLEAR   CSR,CSR+2,TWOCSRS
2151 011024  104425                                    MOV     #BIT3,CSR
2152 011026  104426                                    LOADCSR
2153 011030  013702  002146                            READCSR
2154 011034  042702  177000                            MOV     CSR+2,R2
2155 011040  006302                                    BIC     #177000,R2
2156 011042                                            ASL     R2
2157 011050  005037  002670                            IF R2 LT #167           ;IF I CHANGED IT'S STARTING ADDRESS
2158 011054  000137  004352                              CLR   LOCK
2159 011060                                              JMP   START
2160 011060                                            END ;OF IF R2
2161 011060                                          END ;OF ON.ERROR
2162 011076                                        END ;OF FOR CSRNO
2163 011076                                      END ;OF IF PENDBOX
                                               END ;OF IF HIACBANK
```

```
                                        ;R0 := MAX(HIBANK,UNITOP)
011076                                  IF R0 LT UNITOP THEN LET R0 := UNITOP
                                        ;CHECK SYSTEM SIZE REGISTER
011110  072027  000011                  ASH     #9.,R0
011114  052700  000777                  BIS     #777,R0                 ;R0 = LAST GOOD ADDRESS (LESS 6 LSB'S)
011120  020037  177760                  CMP     R0,SIZELO               ;IS IT RIGHT?
011124  001503                          BEQ     SUBAAT
011126  012737  177760  002040          MOV     #SIZELO,ADDRESS
011134  010037  002050                  MOV     R0,GOOD
011140  013737  177760  002056          MOV     SIZELO,BAD
011146  000300                          SWAB    R0
011150  004737  011210                  CALL    SYSSIZE
011154  010137  002476                  MOV     R1,GDSWITCH
011160  013700  177760                  MOV     SIZELO,R0
011164  000300                          SWAB    R0
011166  004737  011210                  CALL    SYSSIZE
011172  010137  002500                  MOV     R1,BDSWITCH
011176  104023                          ERROR   +23
011200  013737  002754  002020          MOV     $ERTTL,LASTERROR        ;DON'T COUNT AS "DETECTED BUT NOT ISOLATED"
011206  000452                          BR      SUBAAT
                                        ;DETERMINE SWITCH SETTINGS IN R1 FROM ADDRESS IN R0
011210  005001                  SYSSIZE:CLR     R1
011212                                  IF #BIT0 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT2
011224                                  IF #BIT1 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT0
011236                                  IF #BIT2 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT4
011250                                  IF #BIT3 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT7
011262                                  IF #BIT4 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT3
011274                                  IF #BIT5 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT1
011306                                  IF #BIT6 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT5
011320                                  IF #BIT7 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT6
011332  000207                          RETURN
```

```
2201 011334                            SUBAAT: SUBTST  <<MOVE LOADERS IF NECESSARY>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MOVE LOADERS IF NECESSARY
                                       ;*****************************************************************************
2202                                           ;THE TOP 16K OF THE PROGRAM (WHICH INCLUDES LOADERS) WILL BE MOVED
2203                                           ;TO AN MK11 PROTECTED AREA IF IT IS NOW IN MK11 MEMORY.
2204                                           ;IF IT IS IN CORE IT WILL BE LEFT ALONE.
2205 011334                                   IF CPUBIT EQ #MASTER
2206 011344  042737  100000  003024             BIC    #BIT15,CONFIG+6          ;UNPROTECT OLD LOADER SPACE
2207 011352                                     BEGIN FIRSTPROTECT
2208 011352                                       FOR BANK := #1 TO #167
2209 011360  004737  042422                          CALL EXBANK
2210 011364                                          IF ACFLAG IS TRUE AND BMFLAG IS FALSE
2211 011400                                            IF KPFLAG IS TRUE OR MKFLAG IS FALSE
2212 011414                                              LEAVE FIRSTPROTECT
2213 011416                                            END ;OF IF KPFLAG
2214 011416                                          END ;OF IF ACFLAG
2215 011416                                       END ;OF FOR BANK
2216 011432  012737  000001  002106               MOV #1,BANK
2217 011440  004737  042422                       CALL        EXBANK
2218 011444                                     END FIRSTPROTECT
2219 011444  013737  002106  002710             MOV   BANK,LOADHOME
2220 011452  013700  002110                     MOV   BANKINDEX,R0
2221 011456  052760  100000  003016             BIS   #BIT15,CONFIG(R0)
2222 011464                                     IF LOADHOME NE #1
2223 011474  012737  000004  002100               MOV #4,NOPAR                 ;PARITY ACTION   COUNT & IGNORE
2224 011502  013700  002710                       MOV LOADHOME,R0              ;DESTINATION BANK
2225 011506  012701  000001                       MOV #1,R1                    ;SOURCE BANK
2226 011512  00473   042072                       CALL BANKMOV
2227 011516  004737  042370                       CALL NEWLOAD                 ;MAP KERNEL TO NEW LOADER BANK
2228 011522  005037  002100                       CLR NOPAR
2229 011526  005037  002074                       CLR PARCNT
2230 011532                                     END ;OF IF LOADHOME
2231                                            ;COPY MAPPING FOR ANY SLAVES
2232 011532  012700  172340                     MOV   #KIPAR0,R0
2233 011536  012701  002550                     MOV   #KI0,R1
2234 011542  012705  000010                     MOV   #8.,R5
2235 011546  012021                     1$:     MOV   (R0)+,(R1)+
2236 011550  077502                             SOB   R5,1$
2237 011552                                   END ;OF IF CPUBIT
2238
2239 011552                                   SET     STOPOK
```

```
                                        SUBTST  <<MULTIPORT HOOK>>
                                ;*****************************************************************************
                                ;*SUBTEST        MULTIPORT HOOK
                                ;*****************************************************************************
                                        ;THIS IS WHERE WE SEPARATE THE MASTER FROM THE SLAVES.
                                        ;THE MASTER IS THE PROCESSOR RUNNING WITH LOCATION "CPUBIT"
                                        ;EQUAL TO #MASTER (BIT4).
                                        ;
                                        ;SLAVES ARE STOPPED HERE.
                                        ;IF THERE IS AN IIST AND FIELD SERVICE IS ALLOWING US TO USE IT
                                        ;  THE SLAVE LOWERS HIS PRIORITY AND WAITS FOR AN INTERRUPT
                                        ;  FROM THE MASTER'S IIST.
                                        ;ELSE
                                        ;  THE SLAVE MOVES INTO THE UIPAR'S AND EXECUTES A LITTLE PROGRAM
                                        ;  THAT LOOKS FOR A COUNT PATTERN "10,9,8,7,6,5,4,3,2,1,0" IN HIS
                                        ;  PSEUDO TTY BUFFER (PTYBUF+ID).
011560  104424                        CACHOFF                 ;TURN CACHE OFF
011562                                IF MULTIPORT IS FALSE THEN JUMPTO SUBAAR
011574                                IF CPUBIT EQ #SLAVE1
011604  012700  000002                  MOV   #2,R0
011610  000137  011656                  JMP   CPUID
011614                                END ;OF IF CPUBIT
011614                                IF CPUBIT EQ #SLAVE2
011624  012700  000004                  MOV   #4,R0
011630  000137  011656                  JMP   CPUID
011634                                END ;OF IF CPUBIT
011634                                IF CPUBIT EQ #SLAVE3
011644  012700  000006                  MOV   #6,R0
011650  000137  011656                  JMP   CPUID
011654                                END ;OF IF CPUBIT
011654  005000                        CLR     R0              ;MUST BE MASTER THEN

011656                          CPUID:  IF NOIIST IS TRUE
011664  013702  177764                  MOV   SYSTID,R2
011670                                ELSE
011672  012777  100000  171036          MOV   #BIT15,@IISTACR
011700  017702  171032                  MOV   @IISTACR,R2
011704  072227  177770                  ASH   #-8.,R2
011710  042702  177774                  BIC   #^C3,R2
011714                                END ;OF IF NOIIST
011714  010260  002606                MOV     R2,PORTDIR(R0)

                                        ;THIS IS WHERE THE SLAVES COME TO STOP
011720  010003                  STOPCPU:MOV     R0,R3
011722                                IF NOIIST IS TRUE
011730                                  IF R0 EQ #0 THEN GOTO MP1     ;SKIP IF I'M THE MASTER
011734  052760  100000  002616          BIS   #BIT15,TASK(R0)
011742                                  BMOV  WAITSTUFF
011750  005337  002670                  DEC   LOCK                    ;ALLOW OTHERS TO RUN
011754  062700  002636                  ADD   #PTYBUF,R0              ;R0 POINTS TO COUNT DOWN LOCATION

                                                                      ;WAIT FOR MASTER TO COUNT DOWN!
011760  000137  177640                  JMP   FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
011764                                ELSE
011766  004737  061074                  CALL  IISTINIT
011772                                  IF R0 EQ #0 THEN GOTO MP1     ;SKIP IF I'M THE MASTER
011776  012777  000001  170732          MOV   #1,@IISTACR
```

```
 2296 012004  012777  000004  170726          MOV   #BIT2,@IISTADR        ;ENABLE INTERRUPTS
 2297 012012  000234                          SPL   4
 2298 012014  052760  100000  002616          BIS   #BIT15,TASK(R0)
 2299 012022  005337  002670                  DEC   LOCK                  ;ALLOW OTHERS TO RUN
 2300 012026  000001                          WAIT                        ;WAIT IF I'M A SLAVE
 2301 012030  000137  050726                  JMP   TASKDO
 2302 012034                                END ;OF IF NOIIST
```

```
 2305 012034                            WAITSTUFF:SUBTST        <<SLAVES WAIT FOR MASTER TO COUNT DOWN>>
                                        ;*********************************************************************
                                        ;*SUBTEST        SLAVES WAIT FOR MASTER TO COUNT DOWN
                                        ;*********************************************************************
 2306 012034  012702  000014            1$:     MOV     #12.,R2         ;V177640
 2307 012040  012701  000013                    MOV     #11.,R1         ;V177644
 2308 012044  005302                    2$:     DEC     R2              ;V177650
 2309 012046  005301                            DEC     R1              ;V177652
 2310 012050  020210                    3$:     CMP     R2,(R0)         ;V177654
 2311 012052  001776                            BEQ     3$              ;V177656
 2312 012054  020110                            CMP     R1,(R0)         ;V177660
 2313 012056  001366                            BNE     1$              ;V177662
 2314 012060  005701                    4$:     TST     R1              ;V177664
 2315 012062  001370                            BNE     2$              ;V177666
 2316 012064  000137  061216                    JMP     SLAVUP          ;V177670
```

```
2319 012070                     MP1:    SUBTST  <<BOOT UP ALL EXISTING CPU'S>>
                                ;*****************************************************************************
                                ;*SUBTEST       BOOT UP ALL EXISTING CPU'S
                                ;*****************************************************************************
2320                                    ;ALL SLAVES ARE BOOTED AS FOLLOWS
2321                                    ;
2322                                    ;SETUP A SOFTWARE SWITCH REGISTER.
2323                                    ;IF WE ARE USING IIST'S.
2324                                    ;  BEGIN BOOTLOOP
2325                                    ;    FOR EACH OF 4 POSSIBLE CPU'S.
2326                                    ;      SETUP STACK VALUE LESS THAN PREVIOUS CPU.
2327                                    ;      CLEAR ACKNOWLEDGE.
2328                                    ;      POINT IIST INTERRUPT VECTOR TO START.
2329                                    ;MP2:  WAIT FOR THE MASTER'S IIST TO BE READY (SHOULD ALREADY BE).
2330                                    ;      INITIALIZE THE MASTER'S IIST (DISABLE BOOTS & INTERRUPTS).
2331                                    ;      INITIATE THE IIST BOOT OF THE SELECTED CPU.
2332                                    ;      WAIT FOR THE WINDOW IN THE BOOT THAT ALLOWS INTERRUPTS.
2333                                    ;      INITIATE THE IIST INTERRUPT OF THE SELECTED CPU.
2334                                    ;      WAIT FOR THE SLAVE TO ACKNOWLEDGE STARTING.
2335                                    ;      IF THE CPU DOES NOT ACKNOWLEDGE
2336                                    ;        IF THE CPU SELECTED IS NOT THE MASTER
2337                                    ;          LEAVE BOOTLOOP.
2338                                    ;        ELSE
2339                                    ;          GOTO MP2.
2340                                    ;        END OF IF THE CPU SELECTED IS NOT THE MASTER.
2341                                    ;      ELSE
2342                                    ;        WAIT FOR TASK DONE FROM SLAVE (TASK=START).
2343                                    ;        UPDATE SLAVE COUNT (THIS SLAVE IS THE HIGHEST # SO FAR).
2344                                    ;        IF THIS WAS THE 4TH CPU THEN LEAVE BOOTLOOP.
2345                                    ;      END OF IF THE CPU DOES NOT ACKNOWLEDGE.
2346                                    ;    END OF FOR EACH OF 4 POSSIBLE CPU'S.
2347                                    ;  END OF BOOTLOOP.
2348                                    ;  IF THERE WERE NO SLAVES
2349                                    ;    CLEAR THE MULTIPROCESSING FLAG 'MULTIPORT'.
2350                                    ;    SET THE IIST VECTOR TO LOOK FOR UNEXPECTED TRAPS.
2351                                    ;  END OF IF THERE WERE NO SLAVES.
2352                                    ;ELSE
2353                                    ;  FOR EACH SLAVE
2354                                    ;    SETUP STACK VALUE LESS THAN PREVIOUS CPU.
2355                                    ;    TYPE 'START SLAVE #N AT ADDRESS 200'.
2356                                    ;    WAIT FOR TASK DONE FROM SLAVE (TASK=START).
2357                                    ;  END OF FOR EACH SLAVE.
2358                                    ;END OF IF WE ARE USING IIST'S.
2359                                    ;RESTORE THE MASTER TO THE NORMAL SWITCH REGISTER
2360                                    ;WAIT A SECOND.
2361                                    ;MAKE SURE I'M THE ONLY PROCESSOR RUNNING.
2362                                    ;SETUP STACK VALUE BACK TO MASTER'S DEFAULT.
2363                                    ;TURN CACHE ON.
```

```
2366
2367
2368 012070  005337  002670                    .ENABL  LSB
2369                                           DEC     LOCK                    ;ALLOW ONE SLAVE TO RUN
2370 012074  013737  002766  002674            ;PASS PSEUDO SWR TO SLAVE
2371 012102  012737  000176  002766            MOV     SWR,MASWR               ;SAVE REAL SWR
2372 012110  017777  170560  170650            MOV     #SWREG,SWR              ;SETUP SOFTWARE SWR
2373 012116                                    MOV     @MASWR,@SWR             ;FILL IT WITH REAL SWR STUFF
2374 012130  012702  000400                    IF NOIIST IS TRUE THEN JUMPTO MP4
2375 012134  012703  000001                    MOV     #BIT8,R2                ;BOOT = BITS 11,10,9,8
2376 012140                                    MOV     #1,R3                   ;INTERRUPT = BITS 3,2,1,0
2377 012140                                    BEGIN BOOTLOOP
2378 012144  162737  000200  002706            FOR R1 := #1 TO #3
2379 012152  013737  002706  000000              SUB   #200,KSTACK             ;SLAVES - PLEASE USE YOUR OWN STACK
2380 012160  012700  000020                      MOV   KSTACK,0                ;PUT IN LOC 0 FOR BOOTSTRAP
2381 012164  072001                              MOV   #MASTER,R0              ;SET FIRST CPU ID BIT
2382 012166  010037  002114                      ASH   R1,R0                   ;SHIFT IT TO CORRECT SPOT
2383 012172  010100                              MOV   R0,CPUBIT               ;CPUBIT = BIT5 OR BIT6 OR BIT7
2384 012174  006300                              MOV   R1,R0                   ;CPU # ---> R0
2385 012176  005037  002672                      ASL   R0                      ;R0 := 2 OR 4 OR 6 ;INDEX VALUE
2386 012202  013704  002742                      CLR   ACK                     ;ALLOW ONLY ONE CPU AT A TIME
2387 012206  012724  004352                      MOV   IISTVEC,R4
2388 012212  012714  000340                      MOV   #START,(R4)+            ;INTERRUPT VECTOR TO START
2389                                             MOV   #340,(R4)               ;HIGH PRIORITY
2390
2391 012216  012737  061165  002574              ;WAIT FOR IIST READY
2392 012224  012777  000001  170504  MP2:        MOV   #5*SECONDS,HUNGTIME
2393 012232  004737  072154                      MOV   #1,@IISTACR
2394 012236                                      CALL  QUE
2395 012240  104061                              ON.ERROR
2396 012242  005037  002730                        ERROR       +61             ;IIST IS HANGING SYSTEM!
2397 012246                                        CLR SLAVES
2398 012250                                        LEAVE       BOOTLOOP
2399 012252  032777  004000  170462              END ;OF ON.ERROR
2400 012256  001762                              BIT   #BIT11,@IISTADR
2401                                             BEQ   MP2
2402 012260  004737  061174
2403 012264  012777  000000  170444              CALL  IISTOFF                 ;INITIALIZE THE IIST & DISABLE BOOTS & INTERRUPTS
2404 012272  010277  170442                      MOV   #0,@IISTACR             ;SELECT THE ACCESS CONTROL REGISTER
2405 012276  012777  000001  170434              MOV   R2,@IISTADR             ;BOOT SOME CPU
2406                                             MOV   #1,@IISTADR             ;NOW!
2407                                             ;THIS DELAY IS GOOD ONLY FOR THE M9312 MULTIPROCESSOR BOOT
2408 012304  012704  140000                      ;THIS DELAY ALSO ASSUMES THAT CACHE IS OFF
2409 012310  000240                      3$:     MOV   #140000,R4      ;THIS DELAY TAKES APPROX 3/4 SECOND
2410 012312  000240                              NOP
2411 012314  000240                              NOP
2412 012316  000240                              NOP
2413 012320  005237  000110                      NOP
2414                                             INC   110             ;CHANGE MOVING LOCATION - SEE BOOT LISTING
2415                                                                   ;THIS STOPS THE BOOT FROM RUNNING THE MEMORY
2416 012324  077407                                                   ;DIAGNOSTIC AND BLOWING UP MY SOFTWARE
                                                 SOB   R4,3$
```

```
2418 012326  012777  000000  170402          MOV   #0,@IISTACR             ;SELECT THE ACCESS CONTROL REGISTER
2419 012334  010377  170400                  MOV   R3,@IISTADR             ;INTERRUPT SOME CPU
2420 012340  012777  000001  170372          MOV   #1,@IISTADR             ;NOW!
2421                                         ;WAIT FOR ACK OR TIMEOUT
2422 012346  012705  000003                  MOV   #3,R5           ;THIS IS APPROX A 3 SECOND DELAY
2423 012352  005004                          CLR   R4
2424 012354                          1$:     IF ACK IS FALSE
2425 012362  005237  000110                    INC 110                    ;CHANGE MOVING LOCATION - SEE BOOT LISTING
2426                                           ;THIS STOPS THE BOOT FROM RUNNING THE MEMORY
2427                                           ;DIAGNOSTIC AND BLOWING UP MY SOFTWARE.
2428 012366  077406                            SOB    R4,1$
2429 012370  077507                            SOB    R5,1$
2430 012372                                  END ;OF IF ACK IS FALSE
2431 012372                                  IF ACK IS FALSE               ;IF THERE IS NO SLAVE AT THIS IISTID #
2432 012400  006302                            ASL R2
2433 012402  006303                            ASL R3
2434 012404                                    IF R3 EQ #BIT4
2435 012412                                      LEAVE BOOTLOOP
2436 012414                                    ELSE
2437 012416                                      GOTO MP2
2438 012420                                    END ;OF IF R3
2439 012420                                  ELSE
2440 012422  005037  002672                    CLR   ACK                  ;ALLOW SLAVE TO PROCEED
2441 012426  012737  000005  002572            MOV #5,HUNGMSB
2442 012434  012737  177777  002574            MOV #-1,HUNGTIME
2443 012442  004737  072154          2$:       CALL        QUE
2444 012446                                    ON.ERROR
2445 012450  162737  000001  002572              SUB       #1,HUNGMSB
2446 012456                                      ON.ERROR
2447 012460  010137  002056                        MOV     R1,BAD
2448 012464  104060                              ERROR   +60              ;SLAVE IS HANGING SYSTEM!
2449 012466  005037  002730                        CLR     SLAVES
2450 012472                                        LEAVE BOOTLOOP
2451 012474                                      END ;OF ON.ERROR
2452 012474                                    END ;OF ON.ERROR
2453 012474  005760  002616                    TST TASK(R0)
2454 012500  100360                            BPL 2$
2455 012502  010137  002730                    MOV R1,SLAVES         ;COUNT OF SLAVES WAS IN R1
2456 012506                                    IF R3 EQ #BIT3 THEN LEAVE BOOTLOOP
2457 012514                                  END ;OF IF ACK
2458 012514  006302                          ASL   R2
2459 012516  006303                          ASL   R3
2460 012520                                END ;OF FOR R1
2461 012530                                END BOOTLOOP
2462 012530                                IF SLAVES EQ #0
2463 012536  005037  003014                  CLR   MULTIPORT
2464 012542  012777  036764  170172          MOV   #IITRAP,@IISTVEC        ;RESTORE UNEXPECTED IIST TRAP
2465 012550                                END ;OF IF SLAVES
2466 012550  000462                        BR      MP3
2467 012552                          MP4:  FOR R1 := #1 TO SLAVES
2468 012556  012700  000020                  MOV   #BIT4,R0
2469 012562  072001                          ASH   R1,R0
2470 012564  010037  002114                  MOV   R0,CPUBIT               ;CPUBIT = BIT5 OR BIT6 OR BIT7
2471 012570  162737  000200  002706          SUB   #200,KSTACK
2472 012576  010100                          MOV   R1,R0
2473 012600  006300                          ASL   R0                      ;R0 = 2 OR 4 OR 6
2474 012602                                  TYPE  MSG081                  ;START SLAVE #
```

```
2475 012606                                          TYPOCS      R1,,1
2476 012614                                          TYPE  MSG082                    ;AT ADDRESS 200
2477 012620  012737  000031  002572                  MOV   #25.,HUNGMSB
2478 012626  012737  177777  002574                  MOV   #-1,HUNGTIME
2479 012634  005037  002672          5$.             CLR   ACK                       ;ALLOW SLAVE TO PROCEED
2480 012640  004737  072154                          CALL  QUE
2481 012644                                          ON.ERROR
2482 012646  162737  000001  002572                    SUB #1,HUNGMSB
2483 012654                                            ON.ERROR
2484 012656  010137  002056                              MOV       R1,BAD
2485 012662  104060                                      ERROR     +60               ;SLAVE IS HANGING SYSTEM
2486 012664                                              CLEAR     SLAVES,MULTIPORT
2487 012674  000137  012716                              JMP       MP3
2488 012700                                            END ;OF ON.ERROR
2489 012700                                          END ;OF ON.ERROR
2490 012700  005760  002616                          TST   TASK(R0)
2491 012704  100353                                  BPL   5$
2492 012706                                        END ;OF FOR R1
2493                                               ;POINT THE MASTER BACK TO THE NORMAL SWR
2494 012716  013737  002674  002766  MP3:          MOV     MASWR,SWR
2495 012724  012737  000020  002114                MOV     #MASTER,CPUBIT
2496 012732  052737  000020  002510                BIS     #MASTER,ALLCPUS
2497                                               ;WAIT A SECOND
2498 012740  005000                                CLR     R0
2499 012742  077001                        4$:     SOB     R0,4$
2500                                               ;STOP ANY CONFUSED MASTER (ME)
2501 012744  005237  002670                        INC     LOCK
2502 012750                                        IF LOCK NE #1
2503 012760  000000                        MHALT3:   HALT
2504 012762  000776                                  BR    MHALT3
2505 012764                                        END ;OF IF LOCK
2506 012764  012737  000020  002114  MP5:          MOV     #MASTER,CPUBIT          ;BACK TO MASTER
2507 012772  012737  002000  002706                MOV     #STACK,KSTACK
2508 013000  104423                                CACHON                  ;TURN CACHE ON
2509                                               .DSABL  LSB
```

```
2512 013002                                     SUBTST  <<CHECK FOR UNIQUE CPU ID NUMBERS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CHECK FOR UNIQUE CPU ID NUMBERS
                                        ;*****************************************************************************
2513 013002  104424                             CACHOFF                 ;TURN CACHE OFF
2514 013004                                     BEGIN SAMESAME
2515 013004  013702  002730                     MOV     SLAVES,R2
2516 013010  006302                             ASL     R2
2517 013012                                     FOR R0 := #0 TO R2 BY #2
2518 013014                                       FOR R1 := #0 TO R2 BY #2
2519 013016                                         IF R0 NE R1
2520 013022                                           IF PORTDIR(R0) EQ PORTDIR(R1)
2521 013032  104041                                     ERROR   +41
2522 013034                                             TYPE    MSG084          ;PROCEEDING AS A SINGLE PORT TEST
2523 013040                                             LEAVE SAMESAME
2524 013042  005037  003014                             CLR     MULTIPORT
2525 013046                                           END ;OF IF PORTDIR(R0)
2526 013046                                         END ;OF IF R0
2527 013046                                       END ;OF FOR R1
2528 013056                                     END ;OF FOR R0
2529 013066                                     END SAMESAME
2530 013066  104423                             CACHON                  ;TURN CACHE ON
2531
2532 013070                                     SUBTST  <<PRINT MULTIPORT DIRECTORY>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PRINT MULTIPORT DIRECTORY
                                        ;*****************************************************************************
2533 013070                                     IF MULTIPORT IS TRUE
2534 013076                                       TYPE  MSG086
2535 013102                                       TYPOCS        PORTDIR
2536 013112  112737  000060  115753               MOVB  #'0,MSGA87
2537 013120                                       FOR R0 := #1 TO SLAVES
2538 013124  010001                                 MOV R0,R1
2539 013126  006301                                 ASL R1
2540 013130  105237  115753                         INCB        MSGA87
2541 013134                                         TYPE        MSG087
2542 013140                                         TYPOCS      PORTDIR(R1)
2543 013150                                       END ;OF FOR R0
2544 013160                                     END ;OF IF MULTIPORT
2545
2546 013160                                     SUBAAR: SUBTST  <<LOAD CSR'S FROM E-TABLE $CDW1 & $CDW2>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       LOAD CSR'S FROM E-TABLE $CDW1 & $CDW2
                                        ;*****************************************************************************
2547 013160                                     IF $CDW1 NE #0 OR $CDW2 NE #0
2548 013174  013701  002334                       MOV   MKCSRS,R1
2549 013200  013737  075214  002144               MOV   $CDW1,CSR
2550 013206  013737  075216  002146               MOV   $CDW2,CSR+2
2551 013214                                       FOR CSRNO := #0 TO #34 BY #2
2552 013220  106301                                 ASLB        R1
2553 013222                                         ON.ERROR
2554 013224  104425                                   LOADCSR
2555 013226                                         END ;OF ON.ERROR
2556 013226                                       END ;OF FOR CSRNO
2557 013244  005237  075142                       INC   $PASS
2558 013250  000137  015050                       JMP   APTHANG           ;GO LOOP FOREVER KEEPING APT ALIVE
2559 013254                                     END ;OF IF $CDW1
```

```
2562 013254                                     SUBTST  <<LEGAL CONFIGURATION CHECK>>
                                        ;****************  ***************************************************************
                                        ;*SUBTEST        LEGAL CONFIGURATION CHECK
                                        ;*****************************************************************************
2563 013254                                     IF CPUBIT EQ #MASTER
2564 013264                                       FOR BANK := #0 TO #167
2565 013270  004737  042422                         CALL        EXBANK
2566 013274  013700  002110                         MOV BANKINDEX,R0
2567                                                ;MAKE SURE THAT EVERYBODY CAN ACCESS EVERY BANK
2568                                                IF MKFLAG IS TRUE
2569 013300                                           ;IF ANYBODY CAN ACCESS
2570                                                  IF #MASTER.SLAVE1!SLAVE2!SLAVE3 SET.IN CONFIG(R0)
2571 013306
2572 013316  013737  002510  002114                     MOV      ALLCPUS,CPUBIT
2573 013324  004737  042422                           CALL     EXBANK
2574 013330  012737  000020  002114                   MOV      #MASTER,CPUBIT
2575                                                  ;IF EVERYBODY CAN'T ACCESS
2576 013336                                           IF ACFLAG IS FALSE AND CONFGERROR IS FALSE
2577 013352                                             SET CONFGERROR
2578 013360                                             CLEAR SLFLAG,SLFLAG+2,SLFLAG+4,SLFLAG+6
2579 013400                                             IF #MASTER SET.IN CONFIG(R0) THEN LET SLFLAG := ONES
2580 013416                                             IF #SLAVE1 SET.IN CONFIG(R0) THEN LET SLFLAG+2 := ONES
2581 013434                                             IF #SLAVE2 SET.IN CONFIG(R0) THEN LET SLFLAG+4 := ONES
2582 013452                                             IF #SLAVE3 SET.IN CONFIG(R0) THEN LET SLFLAG+6 := ONES
2583 013470  104063                                     ERROR +63
2584 013472                                           END ;OF IF ACFLAG
2585 013472                                         END ;OF IF #MASTER!SLAVE1!SLAVE2!SLAVE3
2586 013472                                       END ;OF IF MKFLAG IS TRUE
2587
2588                                                ;MAKE SURE (IF I CAN) THAT EACH BOX HAS ONE & ONLY ONE CSR
2589 013472  004737  042422                       CALL        EXBANK
2590 013476                                       IF ACFLAG IS TRUE AND MKFLAG IS TRUE
2591 013512  016001  003016                         MOV       CONFIG(R0),R1
2592 013516  042701  177770                         BIC       #^C7,R1                 ;R1 = 0 OR 1 OR 2 OR 4
2593 013522                                         IF #BIT12 OFF.IN CONFIG+2(R0)     ;IF NO INTERNAL INTERLEAVE
2594 013532  006301                                   ASL     R1                      ;R1 = 0 OR 2 OR 4
2595 013534                                         END ;OF IF #BIT3
2596 013534                                         IF R1 EQ #0 THEN LET R1 := R1 + #1
2597                                                 ;NOW
2598                                                 ;INTERLEAVE                R1              INTERLEAVE FACTOR
2599                                                 ;----------                --              -----------------
2600                                                 ;4 TO 1 EXT & INTERNAL      4                     8
2601                                                 ;4 TO 1 EXT & NO INT        4                     4
2602                                                 ;2 TO 1 EXT & INTERNAL      2                     4
2603                                                 ;2 TO 1 EXT & NO INT        2                     2
2604                                                 ;   NO EXT & INTERNAL      1                     2
2605                                                 ;   NO EXT & NO INT        1                     0
2606                                                 ;
2607                                                 ;SO
2608                                                 ;R1 - 1 OR 2 OR 4 = "# OF CSR'S ON THIS BANK"
2609 013542  005004                                 CLR       R4
2610 013544  116002  003022                         MOVB      CONFIG+4(R0),R2
2611 013550  012703  000010                         MOV       #8.,R3
2612 013554  006002                         1$:     ROR       R2                      ; COUNT CSR'S IN THIS BANK
2613 013556  005504                                 ADC       R4
2614 013560  077303                                 SOB       R3,1$
2615
```

```
2616                                                    ;IF # OF CSR'S IS WRONG.
2617 013562                                             IF R4 NE R1 AND CONFGERROR IS FALSE
2618 013574                                               SET     CONFGERROR
2619 013602  104064                                       ERROR   +64
2620 013604                                             END ;OF IF R4
2621 013604                                           END ;OF IF ACFLAG
2622 013604                                         END ;OF FOR BANK
2623 013620                                       END ;OF IF CPUBIT
```

```
 2626 013620                            SUBTST  <<PRINT CONFIGURATION DETAILS>>
                                ;*****************************************************************************
                                ;*SUBTEST        PRINT CONFIGURATION DETAILS
                                ;*****************************************************************************
 2627 013620  005037  002466            CLR     MJSIZE
 2628 013624  005037  002470            CLR     MKSIZE
 2629 013630                            FOR R1 := #0 TO #167*3*2 BY #6
 2630 013632                              IF CPUBIT SET.IN CONFIG(R1)
 2631 013642                                IF #BIT14!BIT13 OFF.IN CONFIG(R1) THEN LET MJSIZE := MJSIZE + #1
 2632 013656                                IF #BIT14 OFF.IN CONFIG(R1) AND #BIT13 SET.IN CONFIG(R1)
 2633 013676                                  LET MKSIZE := MKSIZE + #1
 2634 013702                                END ;OF IF MK11 MEMORY
 2635 013702                              END ;OF IF ACCESSABLE BY CPU
 2636 013702                            END ;OF FOR ALL BANKS IN TABLE
 2637 013714  006337  002466            ASL     MJSIZE
 2638 013720  006337  002466            ASL     MJSIZE
 2639 013724  006337  002466            ASL     MJSIZE
 2640 013730  006337  002466            ASL     MJSIZE                  ;MJSIZE :- MJSIZE * 16.
 2641 013734  006337  002470            ASL     MKSIZE
 2642 013740  006337  002470            ASL     MKSIZE
 2643 013744  006337  002470            ASL     MKSIZE
 2644 013750  006337  002470            ASL     MKSIZE                  ;MKSIZE :  MKSIZE * 16.
 2645 013754  005237  002516            INC     UNITOP
 2646 013760  006337  002516            ASL     UNITOP
 2647 013764  006337  002516            ASL     UNITOP
 2648 013770  006337  002516            ASL     UNITOP
 2649 013774  006337  002516            ASL     UNITOP          ;UNITOP :- UNITOP * 16.
 2650 014000                            LET I := MJSIZE + MKSIZE
 2651 014014                            IF I LT UNITOP THEN LET I := UNITOP
 2652 014032                            TYPE    $CRLF
 2653 014036                            TYPDEC  I
 2654 014044                            TYPE    MSG070
 2655 014050                            TYPDEC  MJSIZE
 2656 014056                            TYPE    MSG071
 2657 014062                            TYPDEC  MKSIZE
 2658 014070                            TYPE    MSG072
 2659 014074                            IF #SW6 SET.IN @SWP OR CONFGERROR IS TRUE
 2660 014112  004737  035402              CALL PCONFIG
 2661 014116                            END ;OF IF #SW6
```

```
 2664 014116                                    SUBTST  <<CHECK APT SIZING>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        CHECK APT SIZING
                                                ;*****************************************************************************
 2665 014116                                    IF APTFLAG IS TRUE AND APTSIZE IS TRUE
 2666 014132  005037  002534                      CLR    TEMP
 2667 014136  012700  075164                      MOV    #$MAMS1,R0
 2668 014142                                      FOR R2 := #0 TO #4
 2669 014144                                        IFB 1(R0) NE #0
 2670 014152  111001                                  MOVB       (R0),R1
 2671 014154  042701  177400                          BIC        #177400,R1
 2672 014160                                          IF 2(R0) LT #0
 2673 014166  000261                                    SEC
 2674 014170                                          ELSE
 2675 014172  000241                                    CLC
 2676 014174                                          END ;OF IF 2(R0)
 2677 014174  006101                                  ROL        R1
 2678 014176  005201                                  INC        R1                ;TO COMPENSATE FOR 4 BANKS BEING (0-3)
 2679 014200  006301                                  ASL        R1
 2680 014202  006301                                  ASL        R1
 2681 014204  006301                                  ASL        R1
 2682 014206  006301                                  ASL        R1
 2683 014210  163701  002534                          SUB        TEMP,R1
 2684 014214  010137  002534                          MOV        R1,TEMP
 2685 014220                                          IFB 1(R0) EQ #1
 2686 014230  060137  002522                            ADD      R1,APTCORE
 2687 014234                                          END ;OF IFB 1(R0)
 2688 014234                                          IFB 1(R0) EQ #4
 2689 014244  060137  002524                            ADD      R1,APTMOS
 2690 014250                                          END ;OF IFB 1(R0)
 2691 014250  062700  000004                          ADD        #4,R0
 2692 014254                                        END ;OF IFB 1(R0)
 2693 014254                                      END ;OF FOR R2
 2694 014264                                      IF APTCORE NE MJSIZE OR APTMOS NE MKSIZE
 2695 014304  104051                                ERROR        +51
 2696 014306                                      END ;OF IF APTCORE
 2697
 2698                                             ;CHECK FOR CORRECT NUMBER OF CPU'S
 2699 014306  013700  002730                      MOV    SLAVES,R0
 2700 014312  005200                              INC R0                   ;R0 = 1, 2, 3, OR 4
 2701 014314                                      IF $DDW6 NE R0
 2702 014322  010037  002050                        MOV R0,GOOD
 2703 014326  013737  075234  002056                MOV $DDW6,BAD
 2704 014334  104065                                ERROR +65
 2705 014336                                      END ;OF $DDW6
 2706 014336                                    END ;OF IF APTFLAG
 2707
 2708 014336  004737  015104                    CALL     DOBACK                  ;WRITE BACKGROUND PATTERN
```

```
                                LOOP:   NEWTST  <<DIAGNOSTIC MODE DISPATCH ROUTINE>>
                                ;*******************************************************************************
                                ;*TEST 5         DIAGNOSTIC MODE DISPATCH ROUTINE
                                ;*******************************************************************************
     014342  000004             TST5:   SCOPE
2711 014344  005037  002332             CLR     CONTFLAG
2712 014350  017700  166412             MOV     @SWR,R0         ;GET SWITCHES
2713 014354  042700  177761             BIC     #^C16,R0        ;MASK TO ONLY MODE BITS
2714 014360  004770  014370             CALL    @DISPTBL(R0)    ;DISPATCH TO ROUTINE THROUGH NEXT TABLE
2715 014364  000137  014410             JMP     MEMDONE         ;GO TO NEXT TEST
2716 014370  015204             DISPTBL:BAFPAF  ;MODE 0;BANKS FORWARD, PATTERNS FORWARD
2717 014372  015320                     BAFPAR  ;MODE 1;BANKS FORWARD, PATTERNS REVERSE
2718 014374  015434                     BAWPAF  ;MODE 2;BANKS WORST FIRST, PATTERNS FORWARD
2719 014376  015572                     BAWPAR  ;MODE 3;BANKS WORST FIRST, PATTERNS REVERSE
2720 014400  015730                     PAFBAF  ;MODE 4;PATTERNS FORWARD, BANKS FORWARD
2721 014402  016066                     PAFBAW  ;MODE 5;PATTERNS FORWARD, BANKS WORST FIRST
2722 014404  016246                     PARBAF  ;MODE 6;PATTERNS REVERSE, BANKS FORWARD
2723 014406  016404                     PARBAW  ;MODE 7;PATTERNS REVERSE, BANKS WORST FIRST
2724                                    ;**NOTE** MARGINS FOLLOW PATTERNS (FORWARD IS (0,2,3,4,5))
2725                                    ;(REVERSE IS (5,4,3,2,0))
```

```
 2729 014410  004737  015104          MEMDONE:CALL    DOBACK                          ;CHECK BACKGROUND PATTERN
 2730 014414                                  NEWTST<<UNIQUE BANK TEST>>
                                      ;*****************************************************************************
                                      ;*TEST 6        UNIQUE BANK TEST
                                      ;*****************************************************************************
      014414  000004                  TST6:   SCOPE
 2731                                         ;MAKE SURE THAT EACH BANK CAN HAVE UNIQUE DATA
 2732                                         ;WRITE AND READ THE BANK NUMBER IN EACH BANK (EXCEPT WHERE THE PROGRAM IS)
 2733 014416                                  IF SELONLY IS FALSE
 2734 014424                                    SET   HEADER,MU1
 2735 014440  004737  024370                    CALL  MT0027
 2736 014444                                    SET   HEADER
 2737 014452  005037  002116                    CLR   MUT
 2738 014456                                  END ;OF IF SELONLY
 2739
 2740 014456                                  NEWTST  <<FORCE ADDRESS PARITY ERRORS>>
                                      ;*****************************************************************************
                                      ;*TEST 7        FORCE ADDRESS PARITY ERRORS
                                      ;*****************************************************************************
      014456  000004                  TST7:   SCOPE
 2741                                         ;THIS MAKES SURE THAT ALL ACCESSABLE MEMORY LOCATIONS WILL GIVE A
 2742                                         ;PARITY TRAP IF I FORCE A MEMORY BUSS ADDRESS PARITY ERROR BY
 2743                                         ;USING THE MAINTENANCE REGISTER.
 2744                                         ;
 2745                                         ;WHEN DONE EVERY ADDRESS PARITY ERROR LED IN EVERY MEMORY BOX
 2746                                         ;(MK11'S, MKA11'S, AND MJ11'S) SHOULD BE LITE.
 2747                                         ;YOU CAN ONLY TURN THEM OFF BY TURNING OFF POWER TO THE BOX'S.
 2748 014460                                  IF SELONLY IS FALSE
 2749 014466  012700  060000                    MOV   #FIRST,R0
 2750 014472  012737  000004  002100            MOV   #4,NOPAR                  ;INDICATE PARITY ACTION
 2751 014500                                    BMOV  ADDPAR
 2752 014506                                    FOR BANK := #0 TO #167
 2753 014512  004737  042422                      CALL EXBANK
 2754 014516                                      IF ACFLAG IS TRUE
 2755 014524  005037  002074                        CLR       PARCNT
 2756 014530  004737  026042                        CALL SUPD01
 2757 014534                                        IF PARCNT NE #1
 2758 014544  104035                                  ERROR +35
 2759 014546                                        END ;OF IF PARCNT
 2760 014546                                      END ;OF IF ACFLAG
 2761 014546                                    END ;OF FOR BANK
 2762 014562  005037  002100                    CLR   NOPAR                     ;INDICATE PARITY ACTION
 2763 014566                                  END ;OF IF SELONLY
 2764 014566  000405                          BR      SUBAAU
 2765
 2766                                         ;THESE 3 INSTRUCTIONS ARE MOVED TO THE USER PAR'S IN ORDER TO
 2767                                         ;CAUSE ABORTS FROM THE BANK UNDER TEST VICE THE PROGRAM SPACE
 2768 014570  012737  000002  177750  ADDPAR: MOV     #BIT1,MAINT             ;V177640        ;CREATE ADDRESS PARITY ERROR
 2769 014576  005710                          TST     (R0)                    ;V177646        ;THIS WILL ABORT & INCREMENT PARCNT
 2770 014600  000207                          RETURN                          ;V177650
```

```
 2773 014602                            SUBAAU: IF SBEFLAG IS TRUE
 2774 014610                                      IF LASTERROR EQ $ERTTL
 2775 014620  104050                                ERROR       +50
 2776 014622                                      END ;OF IF LASTERROR
 2777 014622                                    END ;OF IF SBEFLAG
 2778
 2779 014622                                    SET     WRITEONLY
 2780 014630  005137  002744                    COM     SOFTPAT
 2781 014634  004737  015104                    CALL    DOBACK                          ;RESTORE BACKGROUND PATTERN
 2782 014640  005037  002502                    CLR     WRITEONLY
 2783 014644                                    IF MULTIPORT IS TRUE THEN JUMPTO MAST01
 2784 014656                            FLUSH:  SUBTST  <<FLUSH OUT DBE'S>>
                                        ;*************************************************************************
                                        ;*SUBTEST       FLUSH OUT DBE'S
                                        ;*************************************************************************
 2785 014656  004737  024754                    CALL    MT0030
```

```
                                        .SBTTL  END OF PASS ROUTINE
                                ;*******************************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER EACH PASSES THRU THE PROGRAM
                                ;*TYPE 'END PASS #XXXXX'' (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO LOOP
014662  005037  002022        $EOP:   CLR     SBEFLAG
014666  005037  002542                CLR     FSINFLAG
014672  013737  002754  002020        MOV     $ERTTL,LASTERROR
014700  005237  075142                INC     $PASS           ;;INCREMENT THE PASS NUMBER
014704  042737  100000  075142        BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
014712                                TYPE    MSG077          ;;TYPE 'END PASS #''
014716                                IF #SW11 SET,IN @SWR OR QVFLAG IS TRUE
014734                                  TYPE  MSG035          ;QV
014740  005037  002440                  CLR   QVFLAG
014744                                END ;OF IF SW11
014744                                TYPDEC  $PASS
014752  013700  000042                MOV     42,R0           ;;GET MONITOR ADDRESS
014756  001430                        BEQ     $DOAGAIN        ;;BRANCH IF NO MONITOR
014760  022700  002000        $ZAP42: CMP     #STACK,R0       ;ARE WE UNDER RT11
014764  001425                        BEQ     $DOAGAIN        ;YES - BRANCH
                                ;WE ARE UNDER (HEAVEN HELP US) XXDP!
014766                                PUSH    R0
014770  004737  043554                CALL    SHUTUP
014774                                POP     R0
014776  000005                        RESET                   ;;CLEAR THE WORLD
015000  004710                $ENDAD: CALL    (R0)            ;;GO TO MONITOR
015002  000240                        NOP                     ;;SAVE ROOM
015004  000240                        NOP                     ;;FOR
015006  000240                        NOP                     ;;ACT11
015010                          $DOAGN: ;UNDO SHUTUP STUFF
                                ;               RESTORE STACK
                                ;               ENERGIZE UNIBUS MAP & 22 BIT ADDRESSING
                                ;               ENERGIZE MEMORY MANAGEMENT
                                ;               PUT LOADERS BACK HOME
015010  013706  002706                MOV     KSTACK,SP
015014  052737  000060  172516        BIS     #BIT5!BIT4,MMR3
015022  104420                        ENERGIZE                ;TURN ON MEMORY MANAGEMENT
015024  013700  002710                MOV     LOADHOME,R0             ;DESTINATION BANK
015030  012701  000001                MOV     #1,R1                   ;SOURCE BANK
015034  004737  042072                CALL    BANKMOV
015040                          $DOAGAIN:IF $USWR EQ $PASS      ;IF APT LIMITING # OF PASSES
015050  012701  000050          APTHANG:  MOV   #50,R1
015054  077001                  2$:       SOB   R0,2$
015056  062737  000001  075144            ADD   #1,$DEVCT
015064  005537  075146                    ADC   $UNIT
015070  077107                            SOB   R1,2$
015072  005237  075142                    INC   $PASS
015076  000764                            BR    APTHANG
015100                                END ;OF IF $USWR
015100  000137  014342                JMP     LOOP            ;RETURN
```

```
 2843 015104                        DOBACK: SUBTST  <<WRITE BACKGROUND PATTERNS>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       WRITE BACKGROUND PATTERNS
                                    ;*****************************************************************************
 2844 015104  005037  002120                CLR     PATTERN
 2845 015110                                FOR BANK := #0 TO #167
 2846 015114  004737  042422                  CALL  EXBANK
 2847 015120                                  IF ACFLAG IS TRUE AND PFLAG IS FALSE
 2848 015134                                    SET         HEADER,MUT
 2849 015150  004737  021222                   CALL        MKTEST          ;CALL   MJTEST WOULD ALSO WORK
 2850 015154  005037  002116                   CLR         MUT
 2851 015160                                    SET         HEADERR
 2852 015166                                  END ;OF IF ACFLAG
 2853 015166                                END ;OF FOR BANK
 2854 015202  000207                        RETURN
```

```
                                        .SBTTL  MTEST MODES

015204                          BAFPAF: SUBTST  <<BANKS FORWARD,PATTERNS FORWARD      **RECURSIVE**>>
                                ;*********************************************************************
                                ;*SUBTEST        BANKS FORWARD,PATTERNS FORWARD      **RECURSIVE**
                                ;*********************************************************************
015204  005037  002106                  CLR     BANK            ;SET BANK TO 0
                                        ;START OF BANK LOOP
015210  004737  042422          1$:     CALL    EXBANK          ;EXAMINE BANK
015214  005737  002124                  TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
015220  001417                          BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
015222  005737  002132                  TST     RRFLAG          ;RELOCATION REQUIRED?
015226  001014                          BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
015230  005037  002120                  CLR     PATTERN         ;SET PATTERN TO 0
                                        ;START OF PATTERN LOOP
015234  005037  002112          2$:     CLR     MARGIN          ;SET MARGIN TO 0
                                        ;START OF MARGIN LOOP
015240  004737  016564          3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
                                        ;TERMINATION OF MARGIN LOOP
015244  004737  043006                  CALL    INCMAR          ;NEXT HIGHER MARGIN
015250  001373                          BNE     3$              ;IF NOT DONE - LOOP ON ' ARGIN
                                        ;TERMINATION OF PATTERN LOOP
015252  004737  042746                  CALL    INCPAT          ;GO SEE IF THIS IS THE LAST PATTERN
015256  001366                          BNE     2$              ;NO - LOOP ON THIS PATTERN
                                        ;TERMINATION OF BANK LOOP
015260  004737  042772          4$:     CALL    INCBNK          ;NEXT HIGHER BANK
015264  001351                          BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
                                        ;END OF LOOPS
015266  005737  002134                  TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
015272  001401                          BEQ     5$              ;NO - SKIP
015274  000207                          RETURN                  ;YES - RETURN
015276  004737  041130          5$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
015302                                  ON.ERROR THEN $RETURN
                                        ;**NOTE** RECURSIVE CALL
015306  004737  015204                  CALL    BAFPAF          ;CALL SELF
015312  004737  041604                  CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
015316  000207                          RETURN
```

```
 2893 015320                        BAFPAR: SUBTST  <<BANKS FORWARD,PATTERNS REVERSE      **RECURSIVE**>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       BANKS FORWARD,PATTERNS REVERSE      **RECURSIVE**
                                    ;*****************************************************************************
 2894 015320  005037  002106               CLR     BANK            ;SET BANK TO 0
 2895                                       ;START OF BANK LOOP
 2896 015324  004737  042422        1$:     CALL    EXBANK          ;EXAMINE BANK
 2897 015330  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 2898 015334  001417                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2899 015336  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
 2900 015342  001014                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 2901 015344  004737  042762               CALL    SETPAT          ;SET HIGH PATTERN FOR CORRECT MEMORY
 2902                                       ;START OF PATTERN LOOP
 2903 015350  004737  043212        2$:     CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
 2904                                       ;START OF MARGIN LOOP
 2905 015354  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 2906                                       ;TERMINATION OF MARGIN LOOP
 2907 015360  004737  043152               CALL    DECMAR          ;NEXT LOWER MARGIN
 2908 015364  100373                       BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 2909                                       ;TERMINATION OF PATTERN LOOP
 2910 015366  005337  002120               DEC     PATTERN         ;IS THIS THE LAST PATTERN?
 2911 015372  100366                       BPL     2$              ;NO - LOOP ON THIS PATTERN
 2912                                       ;TERMINATION OF BANK LOOP
 2913 015374  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 2914 015400  001351                       BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
 2915                                       ;END OF LOOPS
 2916 015402  005737  002134               TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 2917 015406  001401                       BEQ     5$              ;NO - SKIP
 2918 015410  000207                       RETURN                  ;YES - RETURN
 2919 015412  004737  041130        5$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 2920 015416                               ON.ERROR THEN $RETURN
 2921                                       ;**NOTE** RECURSIVE CALL
 2922 015422  004737  015320               CALL    BAFPAR          ;CALL SELF
 2923 015426  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 2924 015432  000207                       RETURN
```

```
 2927 015434                        BAWPAF: SUBTST  <<BANKS WORST FIRST,PATTERNS FORWARD  **RECURSIVE**>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       BANKS WORST FIRST,PATTERNS FORWARD  **RECURSIVE**
                                    ;*****************************************************************************
 2928 015434  005037  002106               CLR     BANK            ;SET BANK TO 0
 2929                               ;START OF BANK LOOP
 2930 015440  004737  042422        1$:     CALL    EXBANK          ;EXAMINE BANK
 2931 015444  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 2932 015450  001422                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2933 015452  005737  002136               TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)?
 2934 015456  001417                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2935 015460  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
 2936 015464  001014                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 2937 015466  005037  002120               CLR     PATTERN         ;SET PATTERN TO 0
 2938                               ;START OF PATTERN LOOP
 2939 015472  005037  002112        2$:     CLR     MARGIN          ;SET MARGIN TO 0
 2940                               ;START OF MARGIN LOOP
 2941 015476  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 2942                               ;TERMINATION OF MARGIN LOOP
 2943 015502  004737  043006               CALL    INCMAR          ;NEXT HIGHER MARGIN
 2944 015506  001373                       BNE     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 2945                               ;TERMINATION OF PATTERN LOOP
 2946 015510  004737  042746               CALL    INCPAT          ;GO SEE IF THIS IS THE LAST PATTERN
 2947 015514  001366                       BNE     2$              ;NO - LOOP ON THIS PATTERN
 2948                               ;TERMINATION OF BANK LOOP
 2949 015516  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 2950 015522  001346                       BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
 2951                               ;END OF LOOPS
 2952 015524  005137  002712               COM     WORST           ;IS THIS AN EVEN NUMBERED PASS?
 2953 015530  001003                       BNE     5$              ;YES - SKIP
 2954                               ;**NOTE** RECURSIVE CALL
 2955 015532  004737  015434               CALL    BAWPAF          ;CALL SELF
 2956 015536  000207                       RETURN
 2957 015540  005737  002134        5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 2958 015544  001401                       BEQ     6$              ;NO - SKIP
 2959 015546  000207                       RETURN                  ;YES - RETURN
 2960 015550  004737  041130        6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 2961 015554                               ON.ERROR THEN $RETURN
 2962                               ;**NOTE** RECURSIVE CALL
 2963 015560  004737  015434               CALL    BAWPAF          ;CALL SELF
 2964 015564  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 2965 015570  000207                       RETURN
```

```
2968 015572                        BAWPAR: SUBTST <<BANKS WORST FIRST,PATTERNS REVERSE **RECURSIVE**>>
                                   ;*****************************************************************************
                                   ;*SUBTEST       BANKS WORST FIRST,PATTERNS REVERSE **RECURSIVE**
                                   ;*****************************************************************************
2969 015572  005037  002106               CLR     BANK            ;SET BANK TO 0
2970                               ;START OF BANK LOOP
2971 015576  004737  042422        1$:     CALL    EXBANK          ;EXAMINE BANK
2972 015602  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
2973 015606  001422                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
2974 015610  005737  002136               TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
2975 015614  001417                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
2976 015616  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
2977 015622  001014                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
2978 015624  004737  042762               CALL    SETPAT          ;SET HIGH PATTERN FOR CORRECT MEMORY
2979                               ;START OF PATTERN LOOP
2980 015630  004737  043212        2$:     CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
2981                               ;START OF MARGIN LOOP
2982 015634  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
2983                               ;TERMINATION OF MARGIN LOOP
2984 015640  004737  043152               CALL    DECMAR          ;NEXT LOWER MARGIN
2985 015644  100373                       BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
2986                               ;TERMINATION OF PATTERN LOOP
2987 015646  005337  002120               DEC     PATTERN         ;IS THIS THE LAST PATTERN?
2988 015652  100366                       BPL     2$              ;NO - LOOP ON THIS PATTERN
2989                               ;TERMINATION OF BANK LOOP
2990 015654  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
2991 015660  001346                       BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
2992                               ;END OF LOOPS
2993 015662  005137  002712               COM     WORST           ;IS THIS AN EVEN NUMBERED PASS?
2994 015666  001003                       BNE     5$              ;YES - SKIP
2995                               ;**NOTE** RECURSIVE CALL
2996 015670  004737  015572               CALL    BAWPAR          ;CALL SELF
2997 015674  000207                       RETURN
2998 015676  005737  002134        5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
2999 015702  001401                       BEQ     6$              ;NO - SKIP
3000 015704  000207                       RETURN                  ;YES - RETURN
3001 015706  004737  041130        6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
3002 015712                               ON.ERROR THEN $RETURN
3003                               ;**NOTE** RECURSIVE CALL
3004 015716  004737  015572               CALL    BAWPAR          ;CALL SELF
3005 015722  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
3006 015726  000207                       RETURN
```

```
3010 015730                        PAFBAF: SUBTST  <<PATTERNS FORWARD,BANKS FORWARD      **RECURSIVE**>>
                                   ;*************************************************************************
                                   ;*SUBTEST       PATTERNS FORWARD,BANKS FORWARD      **RECURSIVE**
                                   ;*************************************************************************
3011 015730  005037  002120               CLR     PATTERN          ;SET PATTERN TO 0
3012                               ;START OF PATTERN LOOP
3013 015734  005037  002106        1$:     CLR     BANK             ;SET BANK TO 0
3014                               ;START OF BANK LOOP
3015 015740  004737  042422        2$:     CALL    EXBANK           ;EXAMINE BANK
3016 015744  004737  042730               CALL    BANKOK           ;CORRECT MEMORY FOR THIS BANK?
3017 015750  001015                       BNE     4$               ;NO - GO TO BANK LOOP TERMINATOR
3018 015752  005737  002124               TST     ACFLAG           ;CAN WE ACCESS THIS BANK?
3019 015756  001412                       BEQ     4$               ;NO - GO TO BANK LOOP TERMINATION
3020 015760  005737  002132               TST     RRFLAG           ;RELOCATION REQUIRED?
3021 015764  001007                       BNE     4$               ;YES - GO TO BANK LOOP TERMINATION
3022 015766  005037  002112               CLR     MARGIN           ;SET MARGIN TO 0
3023                               ;START OF MARGIN LOOP
3024 015772  004737  016564        3$:     CALL    MTEST            ;GO TEST CORRECT MEMORY
3025                               ;TERMINATION OF MARGIN LOOP
3026 015776  004737  043006               CALL    INCMAR           ;NEXT HIGHER MARGIN
3027 016002  001373                       BNE     3$               ;IF NOT DONE - LOOP ON THIS MARGIN
3028                               ;TERMINATION OF BANK LOOP
3029 016004  004737  042772        4$:     CALL    INCBNK           ;NEXT HIGHER BANK
3030 016010  001353                       BNE     2$               ;IF NOT DONE - LOOP ON THIS BANK
3031                               ;TERMINATION OF PATTERN LOOP
3032 016012  004737  042746               CALL    INCRPT           ;NEXT HIGHER PATTERN
3033 016016  001346                       BNE     1$               ;OK - LOOP; ELSE CONTINUE
3034                               ;END OF LOOPS
3035 016020  005137  002140               COM     TMFLAG           ;COMPLEMENT TYPE OF MEMORY
3036                                                                ;IS THIS AN EVEN NUMBER PASS?
3037 016024  001403                       BEQ     5$               ;YES - SKIP
3038                               ;**NOTE** RECURSIVE CALL
3039 016026  004737  015730               CALL    PAFBAF           ;CALL SELF
3040 016032  000207                       RETURN
3041 016034  005737  002134        5$:     TST     RLFLAG           ;HAVE WE BEEN RELOCATED?
3042 016040  001401                       BEQ     6$               ;NO - SKIP
3043 016042  000207                       RETURN                   ;YES - RETURN
3044 016044  004737  041130        6$:     CALL    RELOCATE         ;MOVE & MAP PROGRAM
3045 016050                               ON.ERROR THEN $RETURN
3046                               ;**NOTE** RECURSIVE CALL
3047 016054  004737  015730               CALL    PAFBAF           ;CALL SELF
3048 016060  004737  041604               CALL    UNRELOCATE       ;UNMOVE & UNMAP PROGRAM
3049 016064  000207                       RETURN
```

```
 3052 016066                            PAFBAW: SUBTST  <<PATTERNS FORWARD,BANKS WORST FIRST  **RECURSIVE**>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PATTERNS FORWARD,BANKS WORST FIRST  **RECURSIVE**
                                        ;*****************************************************************************
 3053 016066  005037  002120                    CLR     PATTERN         ;SET PATTERN TO 0
 3054                                           ;START OF PATTERN LOOP
 3055 016072  005037  002106            1$:     CLR     BANK            ;SET BANK TO 0
 3056                                           ;START OF BANK LOOP
 3057 016076  004737  042422            2$:     CALL    EXBANK          ;EXAMINE BANK
 3058 016102  004737  042730                    CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
 3059 016106  001020                            BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
 3060 016110  005737  002124                    TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 3061 016114  001415                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 3062 016116  005737  002136                    TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
 3063 016122  001412                            BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 3064 016124  005737  002132                    TST     RRFLAG          ;RELOCATION REQUIRED?
 3065 016130  001007                            BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 3066 016132  005037  002112                    CLR     MARGIN          ;SET MARGIN TO 0
 3067                                           ;START OF MARGIN LOOP
 3068 016136  004737  016564            3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 3069                                           ;TERMINATION OF MARGIN LOOP
 3070 016142  004737  043006                    CALL    INCMAR          ;NEXT HIGHER MARGIN
 3071 016146  001373                            BNE     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 3072                                           ;TERMINATION OF BANK LOOP
 3073 016150  004737  042772            4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 3074 016154  001350                            BNE     2$              ;IF NOT DONE - LOOP ON THIS BANK
 3075                                           ;TERMINATION OF PATTERN LOOP
 3076 016156  004737  042746                    CALL    INCRPT          ;NEXT HIGHER PATTERN
 3077 016162  001343                            BNE     1$              ;OK - LOOP; ELSE CONTINUE
 3078                                           ;END OF LOOPS
 3079 016164  005137  002140                    COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
 3080                                                                   ;IS THIS AN EVEN NUMBER PASS?
 3081 016170  001403                            BEQ     5$              ;YES - SKIP
 3082                                           ;**NOTE** RECURSIVE CALL
 3083 016172  004737  016066                    CALL    PAFBAW          ;CALL SELF
 3084 016176  000207                            RETURN
 3085 016200  005137  002712            5$:     COM     WORST           ;4TH PASS?
 3086 016204  001003                            BNE     6$              ;YES - SKIP
 3087                                           ;**NOTE** RECURSIVE CALL
 3088 016206  004737  016066                    CALL    PAFBAW          ;CALL SELF
 3089 016212  000207                            RETURN
 3090 016214  005737  002134            6$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 3091 016220  001401                            BEQ     7$              ;NO - SKIP
 3092 016222  000207                            RETURN                  ;YES - RETURN
 3093 016224  004737  041130            7$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 3094 016230                                    ON.ERROR THEN $RETURN
 3095                                           ;**NOTE** RECURSIVE CALL
 3096 016234  004737  016066                    CALL    PAFBAW          ;CALL SELF
 3097 016240  004737  041604                    CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 3098 016244  000207                            RETURN
```

```
 3101 016246                    PARBAF: SUBTST  <<PATTERNS REVERSE,BANKS FORWARD      **RECURSIVE**>>
                                ;*****************************************************************************
                                ;*SUBTEST       PATTERNS REVERSE,BANKS FORWARD      **RECURSIVE**
                                ;*****************************************************************************
 3102 016246  004737  042762           CALL    HIPAT           ;SET HIGHTEST PATTERNS
 3103                           ;START OF PATTERN LOOP
 3104 016252  005037  002106    1$:     CLR     BANK            ;SET BANK TO 0
 3105                           ;START OF BANK LOOP
 3106 016256  004737  042422    2$:     CALL    EXBANK          ;EXAMINE BANK
 3107 016262  004737  042730            CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
 3108 016266  001015                    BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
 3109 016270  005737  002124            TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 3110 016274  001412                    BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 3111 016276  005737  002132            TST     RRFLAG          ;RELOCATION REQUIRED?
 3112 016302  001007                    BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 3113 016304  004737  043212            CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
 3114                           ;START OF MARGIN LOOP
 3115 016310  004737  016564    3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 3116                           ;TERMINATION OF MARGIN LOOP
 3117 016314  004737  043152            CALL    DECMAR          ;NEXT LOWER MARGIN
 3118 016320  100373                    BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 3119                           ;TERMINATION OF BANK LOOP
 3120 016322  004737  042772    4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 3121 016326  001353                    BNE     2$              ;IF NOT DONE - LOOP ON THIS BANK
 3122                           ;TERMINATION OF PATTERN LOOP
 3123 016330  005337  002120            DEC     PATTERN         ;NEXT LOWER PATTERN
 3124 016334  100346                    BPL     1$              ;OK - LOOP; ELSE CONTINUE
 3125                           ;END OF LOOPS
 3126 016336  005137  002140            COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
 3127                                                           ;IS THIS AN EVEN NUMBER PASS?
 3128 016342  001403                    BEQ     5$              ;YES - SKIP
 3129                           ;**NOTE** RECURSIVE CALL
 3130 016344  004737  016246            CALL    PARBAF          ;CALL SELF
 3131 016350  000207                    RETURN
 3132 016352  005737  002134    5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 3133 016356  001401                    BEQ     6$              ;NO - SKIP
 3134 016360  000207                    RETURN                  ;YES - RETURN
 3135 016362  004737  041130    6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 3136 016366                            ON.ERROR THEN $RETURN
 3137                           ;**NOTE** RECURSIVE CALL
 3138 016372  004737  016246            CALL    PARBAF          ;CALL SELF
 3139 016376  004737  041604            CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 3140 016402  000207                    RETURN
```

```
3143 016404                            PARBAW: SUBTST  <<PATTERNS REVERSE,BANKS WORST FIRST  **RECURSIVE**>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       PATTERNS REVERSE,BANKS WORST FIRST  **RECURSIVE**
                                       ;*****************************************************************************
3144 016404  004737  042762                       CALL    HIPAT           ;SET HIGHTEST PATTERN
3145                                               ;START OF PATTERN LOOP
3146 016410  005037  002106            1$:        CLR     BANK            ;SET BANK TO 0
3147                                               ;START OF BANK LOOP
3148 016414  004737  042422            2$:        CALL    EXBANK          ;EXAMINE BANK
3149 016420  004737  042730                       CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
3150 016424  001020                               BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
3151 016426  005737  002124                       TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
3152 016432  001415                               BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
3153 016434  005737  002136                       TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
3154 016440  001412                               BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
3155 016442  005737  002132                       TST     RRFLAG          ;RELOCATION REQUIRED?
3156 016446  001007                               BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
3157 016450  004737  043212                       CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
3158                                               ;START OF MARGIN LOOP
3159 016454  004737  016564            3$:        CALL    MTEST           ;GO TEST CORRECT MEMORY
3160                                               ;TERMINATION OF MARGIN LOOP
3161 016460  004737  043152                       CALL    DECMAR          ;NEXT LOWER MARGIN
3162 016464  100373                               BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
3163                                               ;TERMINATION OF BANK LOOP
3164 016466  004737  042772            4$:        CALL    INCBNK          ;NEXT HIGHER BANK
3165 016472  001350                               BNE     2$              ;IF NOT DONE - LOOP ON THIS BANK
3166                                               ;TERMINATION OF PATTERN LOOP
3167 016474  005337  002120                       DEC     PATTERN         ;NEXT LOWER PATTERN
3168 016500  100343                               BPL     1$              ;OK - LOOP; ELSE CONTINUE
3169                                               ;END OF LOOPS
3170 016502  005137  002140                       COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
3171                                                                       ;IS THIS AN EVEN NUMBER PASS?
3172 016506  001403                               BEQ     5$              ;YES - SKIP
3173                                               ;**NOTE** RECURSIVE CALL
3174 016510  004737  016404                       CALL    PARBAW          ;CALL SELF
3175 016514  000207                               RETURN
3176 016516  005137  002712            5$:        COM     WORST           ;4TH PASS?
3177 016522  001003                               BNE     6$              ;YES - SKIP
3178                                               ;**NOTE** RECURSIVE CALL
3179 016524  004737  016404                       CALL    PARBAW          ;CALL SELF
3180 016530  000207                               RETURN
3181 016532  005737  002134            6$:        TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
3182 016536  001401                               BEQ     7$              ;NO - SKIP
3183 016540  000207                               RETURN                  ;YES - RETURN
3184 016542  004737  041130            7$:        CALL    RELOCATE        ;MOVE & MAP PROGRAM
3185 016546                                        ON.ERROR THEN $RETURN
3186                                               ;**NOTE** RECURSIVE CALL
3187 016552  004737  016404                       CALL    PARBAW          ;CALL SELF
3188 016556  004737  041604                       CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
3189 016562  000207                               RETURN
```

```
3193 016564                          MTEST:  SUBTST  <<SUBR  SETUP MEMORY TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        SUBR    SETUP MEMORY TEST
                                     ;*****************************************************************************
3194 016564  013700  002112                  MOV     MARGIN,R0
3195 016570  006300                          ASL     R0
3196 016572  010037  177750                  MOV     R0,MAINT                ;SET MARGINS
3197 016576                                  SET     HEADER                  ;INITIALIZE HEADER MESSAGE TYPEOUT
3198 016604                                  SET     MUT                     ;INDICATE THERE IS A MEMORY UNDER TEST
3199 016612  005037  002362                  CLR     PASFLG
3200 016616  005737  002126                  TST     MKFLAG                  ;MK11?
3201 016622  001410                          BEQ     2$                      ;NO - SKIP
3202                                         ;IF CONTFLAG IS FALSE THEN CALL MKCONTROL
3203 016624  005737  002332                  TST     CONTFLAG
3204 016630  001002                          BNE     1$
3205 016632  004737  016664                  CALL    MKCONTROL
3206 016636  004737  021222          1$:     CALL    MKTEST                  ;YES - DO MK11 TESTS
3207 016642  000402                          BR      3$
3208 016644  004737  021512          2$:     CALL    MJTEST                  ;DO MJ11 TESTS
3209 016650  005037  002116          3$:     CLR     MUT                     ;NOW - NO MEMORY UNDER TEST
3210 016654                                  SET     HEADER                  ;ALLOW HEADERS NORMAL
3211 016662  000207                          RETURN
```

```
3214 016664                          MKCONTROL:SUBTST        <<SUBR  TEST MK11 CONTROLLER LOGIC DISPATCH>>
                                     ;*********************************************************************************
                                     ;*SUBTEST        SUBR    TEST MK11 CONTROLLER LOGIC DISPATCH
                                     ;*********************************************************************************
3215                                         ;THIS MODULE AND THE NEXT FEW PAGES SOLVE THE PROBLEM OF
3216                                         ;HOW TO RUN THE CSR TESTS ON EACH MK11 MEMORY
3217                                         ;
3218                                         ;IN ORDER TO TEST EACH CONTROLLER (2 PER BOX) I MUST DO
3219                                         ;  EACH EXISTING BOX
3220                                         ;    IF ECC IS NOT DISABLED
3221                                         ;      EACH SIDE OF EACH BOX
3222                                         ;        FIND THE ADDRESS OF THIS SIDE (DEPENDS ON INTERLEAVE)
3223                                         ;          FIND A LOCATION THAT HAS NO SINGLE BIT ERRORS
3224                                         ;            RUN ALL CSR TESTS
3225                                         ;      NEXT SIDE
3226                                         ;  NEXT BOX
3227 016664                                  IF SELONLY IS TRUE THEN $RETURN
3228 016674                                  PUSH    BANK
3229 016700  112737  000200  002416          MOVB    #200,CSRINDEX           ;SET BIT FOR CONTROLLER
3230 016706  112737  000001  002417          MOVB    #1,CSROUDEX             ;SET BIT FOR CONTROLLER
3231 016714                                  FOR CSRLOOP := #'0 TO #'7
3232 016722                                    IFB CSRINDEX SET.IN MKCSRS
3233 016732  004737  017300                      CALL        ISECCON
3234 016736                                      FOR SIDE := #'0 TO #'1
3235 016744  004737  017610                        CALL      INTKRAP
3236 016750                                        BEGIN CSRSTUFF
3237 016750  005037  002424                        CLR       SUCCESS
3238 016754                                        FOR BANK := CSRLBANK DOWNTO CSRFBANK
3239 016762  004737  042422                          CALL    EXBANK
3240 016766                                          IF ACFLAG IS TRUE AND RRFLAG IS FALSE
3241 017002                                            MAP   BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
3242 017016  104511                                    INVALIDATE            ;INVALIDATE BACKGROUND PATTERN ON 'BANK''
3243 017020  000241                                    CLC
3244 017022                                            IF SPECIAL IS TRUE THEN $CALL SIDEOK
3245 017034                                            ON.NOERROR
3246 017036                                              FOR TESTADD := CSRFIRST TO #LAST BY CSRINC
3247 017044  004737  017374                                CALL      SBETEST
3248 017050                                                ON.NOERROR
3249 017052  104424                                          CACHOFF                 ;TURN CACHE OFF
3250 017054                                                  FOR I := #0 TO #37
3251 017060  005037  002100                                    CLR   NOPAR           ;INDICATE PARITY ACTION
3252 017064                                                    SET   HEADER
3253 017072  005037  002362                                    CLR   PASFLG
3254 017076                                                    LET R0 := I
3255 017102  004737  020114                                    CALL CSRCASE
3256 017106                                                  END ;OF FOR I
3257 017122  104423                                          CACHON                  ;TURN CACHE ON
3258 017124                                                  SET     SUCCESS
3259 017132                                                  LEAVE CSRSTUFF
3260 017134                                                END ;OF ON.NOERROR
3261 017134                                              END ;OF FOR TESTADD
3262 017152                                            END ;OF ON.NOERROR
3263 017152                                          END ;OF IF
3264 017152                                        END ;OF FOR BANK
3265 017166                                        END CSRSTUFF
3266 017166                                        IF SUCCESS IS FALSE
3267 017174  113737  002420  113625                  MOVB    CSRLOOP,MSGA34          ;SETUP CSR NUMBER
```

```
 3268 017202  113737  002422  113642                MOVB    SIDE,MSGB34             ;SETUP SIDE (0 OR 1)
 3269 017210                                         TYPE    MSG034
 3270 017214                                       END ;OF IF SUCCESS
 3271 017214                                     END ;OF FOR SIDE
 3272 017230                                   END ;OF IFB CSRINDEX
 3273 017230  000241                           CLC
 3274 017232  106037  002416                   RORB  CSRINDEX                ;CHANGE TO NEXT CONTROLLER
 3275 017236  106337  002417                   ASLB  CSROUDEX                ;CHANGE TO NEXT CONTROLLER
 3276 017242                                 END ;OF FOR CSRLOOP
 3277 017256  104472                         ECCINIT           ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 3278 017260                                 SET     CONTFLAG
 3279 017266                                 POP     BANK
 3280 017272  004737  042422                 CALL    EXBANK
 3281 017276  000207                         RETURN
```

```
 3284 017300                                  ISECCON:SUBTST  <<IS ECC ON?>>
                                              ;*************************************************************************
                                              ;*SUBTEST        IS ECC ON?
                                              ;*************************************************************************
 3285                                                 ;SETUP CSR NUMBER
 3286 017300  005000                                  CLR     R0                              ;START A ZERO
 3287 017302  113702  002417                          MOVB    CSROUDEX,R2                     ;GET CSR INDEX #2
 3288 017306  106002                          1$:     RORB    R2                              ;GET CSR BIT IN CARRY (MAYBE)
 3289 017310  103403                                  BCS     2$                              ;I GOT IT - SKIP
 3290 017312  062700  000004                          ADD     #4,R0                           ;BUMP CSR ADDRESS LSB'S BY 4
 3291 017316  000773                                  BR      1$                              ;LOOP TILL I FIND THE CSP
 3292 017320  010037  002256                  2$:     MOV     R0,CSRNO                        ;UPDATE CSR NUMBER
 3293 017324  104503                                  CLR1CSR                         ;CLEAR 1 SELECTED MK11 CSR
 3294 017326  104426                                  READCSR
 3295 017330                                          IF #BIT1 SET.IN CSR
 3296 017340                                            TYPE  MSG078                        ;WARNING!  ECC IS DISABLED ON BOX
 3297 017344  113737  002420  112134                    MOVB  CSRLOOP,MSG015
 3298 017352                                            TYPE  MSG015
 3299 017356                                            SET   NOECCFLAG
 3300 017364                                          ELSE
 3301 017366  005037  002474                            CLR   NOECCFLAG
 3302 017372                                          END ;OF IF #BIT1
 3303 017372  000207                                  RETURN
```

```
3306 017374                        SBETEST:SUBTST  <<CHECK FOR SBE FREE LOCATIONS>>
                                   ;*********************************************************************
                                   ;*SUBTEST       CHECK FOR SBE FREE LOCATIONS
                                   ;*********************************************************************
3307                                       ;IN ORDER TO DETERMINE IF A LOCATION IS SBE FREE I DO THIS
3308                                       ;
3309                                       ;WRITE ZEROS WITH ECC DISABLE
3310                                       ;READ ZEROS BACK
3311                                       ;IF NOT ZEROS THEN RETURN ERROR
3312                                       ;
3313                                       ;WRITE ZEROS WITH ECC ENABLED BUT TRAPS DISABLED
3314                                       ;READ ZEROS BACK
3315                                       ;IF NOT ZEROS THEN RETURN ERROR
3316                                       ;
3317                                       ;TEST THE LOCATION FROM THE PAR'S (WITH NO PROGRAM FETCHES)
3318                                       ;IF THERE WERE ANY SBE'S OR DBE'S THEN RETURN ERROR
3319                                       ;
3320                                       ;COMPLIMENT ZEROS TO ONES WITH ECC DISABLE
3321                                       ;READ ONES BACK
3322                                       ;IF NOT ONES THEN RETURN ERROR
3323                                       ;
3324                                       ;WRITE 100,,100000,00000 (CHECKBITS COMPLIMENT OF BEFORE)
3325                                       ;  WITH ECC ENABLED BUT TRAPS DISABLED
3326                                       ;TEST THE LOCATION FROM THE PAR'S (WITH NO PROGRAM FETCHES)
3327                                       ;IF THERE WERE ANY SBE'S OR DBE'S THEN RETURN ERROR
3328                                       ;
3329                                       ;IF NONE OF THE ABOVE FORCES A RETURN ERROR THEN RETURN NO.ERROR
3330                                       .ENABL  LSB
3331 017374  013701  002506                MOV     TESTADD,R1
3332 017400                                SUPERVISOR                  ;ENTER SUPERVISOR MODE
3333 017406  104424                        CACHOFF                     ;TURN CACHE OFF
3334 017410  104471                        ECC1DIS                     ;DISABLE ECC ON 1 SELECTED CSR
3335 017412                                CLEAR   (R1),2(R1)
3336 017420  005711                        TST     (R1)
3337 017422  001061                        BNE     1$
3338 017424  005761  000002                TST     2(R1)
3339 017430  001056                        BNE     1$
3340
3341 017432  104503                        CLR1CSR                     ;CLEAR 1 SELECTED MK11 CSR
3342 017434                                CLEAR   (R1),2(R1)
3343 017442  005711                        TST     (R1)
3344 017444  001050                        BNE     1$
3345 017446  005761  000002                TST     2(R1)
3346 017452  001045                        BNE     1$
3347
3348 017454  104510                        TSTREAD                     ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
3349 017456                                IF #BIT15!BIT4 SET.IN CSR THEN GOTO 1$
3350
3351 017466  104471                        ECC1DIS                     ;DISABLE ECC ON 1 SELECTED CSR
3352 017470  005111                        COM     (R1)
3353 017472  005161  000002                COM     2(R1)
3354 017476  023711  002726                CMP     ONES,(R1)
3355 017502  001031                        BNE     1$
3356 017504  023761  002726  000002        CMP     ONES,2(R1)
3357 017512  001025                        BNE     1$
3358
3359 017514  104503                        CLR1CSR                     ;CLEAR 1 SELECTED MK11 CSR
```

```
3360 017516 005011                      CLR     (R1)
3361 017520 012761 100000 000002        MOV     #BIT15,2(R1)
3362 017526 005711                      TST     (R1)
3363 017530 001016                      BNE     1$
3364 017532 022761 100000 000002        CMP     #BIT15,2(R1)
3365 017540 001012                      BNE     1$
3366
3367 017542 104510                      TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
3368 017544                             IF #BIT15!BIT4 SET.IN CSR THEN GOTO 1$
3369
3370 017554 104417                      KERNEL                  ;ENTER KERNEL MODE
3371 017556 104473                      ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
3372 017560 104423                      CACHON                  ;TURN CACHE ON
3373 017562                             $RETURN NOERROR
3374
3375 017566 104503              1$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3376 017570                             CLEAR   (R1),2(R1)
3377 017576 104417                      KERNEL                  ;ENTER KERNEL MODE
3378 017600 104473                      ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
3379 017602 104423                      CACHON                  ;TURN CACHE ON
3380 017604                             $RETURN ERROR
3381                                    .DSABL  LSB
```

```
3384 017610                                INTKRAP:SUBTST  <<SETUP INTERLEAVE INFO>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       SETUP INTERLEAVE INFO
                                           ;*****************************************************************************
3385                                               ;BASED ON THE STARTING ADDRESS, BOX CAPACITY, INTERLEAVE, AND SIDE
3386                                               ;SETUP VARIABLES TO DETERMINE
3387                                               ;(1)    THE STARTING ADDRESS OF THIS CONTROLLER
3388                                               ;(2)    THE NUMBER TO ADD TO EACH ADDRESS TO STAY IN THIS CONTROLLER
3389                                               ;(3)    THE LAST ADDRESS OF THIS CONTROLLER
3390 017610                                       PUSH    R0
3391 017612  004737  017736                       CALL    GETSIZE
3392 017616  013737  002260  002410               MOV     FIRSTB,CSRFBANK
3393 017624  013737  002262  002412               MOV     LASTB,CSRLBANK
3394 017632  005037  002432                       CLR     SPECIAL
3395 017636  104426                             READCSR                    ;READ CSR
3396 017640  013700  002146                       MOV     CSR+2,R0
3397 017644  072027  177765                       ASH     #-11.,R0
3398 017650  042700  177760                       BIC     #^C17,R0           ;R0 = (0..17) = BITS 14,13,12,11 OF CSR+2
3399 017654                                       CASE R0                    ;IF R0 = 0 CALL NEXT; IF R0 = 1 CALL NEXT+2, ETC.
3400 017664  020234                                 INT..0
3401 017666  020260                                 INT..1
3402 017670  020324                                 INT..2
3403 017672  020350                                 INT..3
3404 017674  020414                                 INT..4
3405 017676  020440                                 INT..5
3406 017700  020504                                 INT..6
3407 017702  020530                                 INT..7
3408 017704  020574                                 INT.10
3409 017706  020574                                 INT.11
3410 017710  020616                                 INT.12
3411 017712  020642                                 INT.13
3412 017714  020706                                 INT.14
3413 017716  020732                                 INT.15
3414 017720  020776                                 INT.16
3415 017722  021022                                 INT.17
3416 017724                                       END                        ;OF CASE
3417 017732                                       POP     R0
3418 017734  000207                               RETURN
```

```
3421 017736                                GETSIZE:SUBTST  <<SUBR  GET SIZE FROM CSR>>
                                           ;*********************************************************************
                                           ;*SUBTEST        SUBR    GET SIZE FROM CSR
                                           ;*********************************************************************
3422                                               ;SETUP FIRSTB AND LASTB
3423 017736                                        PUSH    R0
3424 017740  052737  000010  002144                BIS     #BIT3,CSR               ;GET SET TO READ CSR
3425 017746  042737  000006  002144                BIC     #BIT2!BIT1,CSR
3426 017754  104425                                LOADCSR
3427 017756  104426                                READCSR
3428 017760  042737  000010  002144                BIC     #BIT3,CSR               ;RESTORE THIS FROM "SIZE" MODE
3429 017766  113700  002145                        MOVB    CSR+1,R0                ;GET SIZE
3430 017772  006300                                ASL     R0                      ;R0 = # OF BANKS
3431 017774  110037  002262                        MOVB    R0,LASTB
3432 020000  013700  002146                        MOV     CSR+2,R0
3433                                               ;CORRECT LAST BANK FOR EXTERNAL INTERLEAVE
3434 020004                                        IF #BIT12 SET.IN R0 THEN LET LASTB := LASTB L.SHIFT 1
3435 020016                                        IF #BIT13 SET.IN R0 THEN LET LASTB := LASTB L.SHIFT 1
3436 020030  042700  177000                        BIC     #177000,R0
3437 020034  006300                                ASL     R0
3438 020036  010037  002260                        MOV     R0,FIRSTB
3439 020042  063737  002260  002262                ADD     FIRSTB,LASTB
3440 020050  005337  002262                        DEC     LASTB
3441 020054                                        IF FIRSTB HI #167 THEN LET FIRSTB := #170
3442 020072                                        IF LASTB HI #167 THEN LET LASTB := #167
3443 020110                                        POP     R0
3444 020112  000207                                RETURN
```

```
3448 020114                          ;CSRCASE:SUBTST  <<CSR PATTERN CASE STATEMENT>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        CSR PATTERN CASE STATEMENT
                                     ;*****************************************************************************
3449 020114                                  CASE R0
3450                                           ;WARNING IF YOU CHANGE THIS TABLE ALSO
3451                                           ;CHANGE '$DDW0' - '$DDW5' (THE PATTERN BIT MAP)
3452
3453                                           ;PAT  TIME            DISCRIPTION
3454 020124  022360                  MKCSRT:   MT0006        ;<1 SEC         INITIAL DATA TEST
3455 020126  022456                            MT0010        ;<1 SEC         BYTE ADDRESSING TEST
3456 020130  024172                            MT0025        ;<1 SEC         INTERRUPT ENABLE TEST
3457 020132  022512                            MT0011        ;<2 SEC         CREATE SINGLE BIT ERROR TEST
3458 020134  022570                            MT0012        ;<1 SEC         WRITE BYTE CLEARS SBE TEST
3459 020136  022646                            MT0013        ; 1 SEC         CREATE DOUBLE BIT ERROR TEST
3460 020140  022722                            MT0014        ; 1 SEC         WRITE INHIBIT DURING DATIP WITH DBE
3461 020142  023000                            MT0015        ; 1 SEC         WRITE INHIBIT OF BYTE WITH DBE
3462 020144  023056                            MT0016        ;<1 SEC         WRITE INHIBIT OF WORD WITH DBE
3463 020146  025772                            MT0999        ; 0 SEC         NULL TEST
3464 020150  025772                            MT0999        ; 0 SEC         NULL TEST
3465 020152  025772                            MT0999        ; 0 SEC         NULL TEST
3466 020154  025772                            MT0999        ; 0 SEC         NULL TEST
3467 020156  025772                            MT0999        ; 0 SEC         NULL TEST
3468 020160  025772                            MT0999        ; 0 SEC         NULL TEST
3469 020162  025772                            MT0999        ; 0 SEC         NULL TEST
3470 020164  025772                            MT0999        ; 0 SEC         NULL TEST
3471 020166  025772                            MT0999        ; 0 SEC         NULL TEST
3472 020170  025772                            MT0999        ; 0 SEC         NULL TEST
3473 020172  025772                            MT0999        ; 0 SEC         NULL TEST
3474 020174  025772                            MT0999        ; 0 SEC         NULL TEST
3475 020176  025772                            MT0999        ; 0 SEC         NULL TEST
3476 020200  025772                            MT0999        ; 0 SEC         NULL TEST
3477 020202  025772                            MT0999        ; 0 SEC         NULL TEST
3478 020204  025772                            MT0999        ; 0 SEC         NULL TEST
3479 020206  025772                            MT0999        ; 0 SEC         NULL TEST
3480 020210  025772                            MT0999        ; 0 SEC         NULL TEST
3481 020212  025772                            MT0999        ; 0 SEC         NULL TEST
3482 020214  025772                            MT0999        ; 0 SEC         NULL TEST
3483 020216  025772                            MT0999        ; 0 SEC         NULL TEST
3484 020220  025772                            MT0999        ; 0 SEC         NULL TEST
3485 020222  025772                            MT0999        ; 0 SEC         NULL TEST
3486 020224                                  END ;OF CASE R0
3487 020232  000207                          RETURN
```

```
3490 020234                             SUBTST  <<DETERMINE ADDRESSING ACCORDING TO INTERLEAVE>>
                                ;*********************************************************************
                                ;*SUBTEST       DETERMINE ADDRESSING ACCORDING TO INTERLEAVE
                                ;*********************************************************************
3491                                    ;CSRFBANK := THE FIRST BANK OF THIS CONTROLLER OF THIS CSR
3492                                    ;CSRLBANK := THE LAST BANK OF THIS CONTROLLER OF THIS CSR
3493                                    ;CSRFIRST .= THE FIRST ADDRESS OF THIS CONTROLLER OF THIS CSR
3494                                    ;CSRINC := THE NUMBER TO ADD TO THE ADDRESS PAIR
3495                                    ;       TO RETURN TO THIS CONTROLLER OF THIS CSR
3496                                    ;SPECIAL := A FLAG SET IF THIS BOX IS NOT INTERNALLY INTERLEAVED
3497
3498                                    ;NO INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE
3499 020234                        INT..0: LET CSRFIRST := #FIRST
3500 020242                                SET     SPECIAL
3501 020250                                LET CSRINC := #4
3502 020256  000207                        RETURN
3503
3504                                    ;INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE
3505 020260                        INT..1: LET CSRFBANK := FIRSTB
3506 020266                                IFB SIDE EQ #'0
3507 020276                                  LET CSRFIRST := #FIRST
3508 020304                                ELSE
3509 020306                                  LET CSRFIRST := #FIRST+4
3510 020314                                END ;OF IFB
3511 020314                                LET CSRINC := #10
3512 020322  000207                        RETURN
3513
3514                                    ;NO INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH EVEN DOUBLE WORDS SELECTED?)
3515 020324                        INT..2: LET CSRFIRST := #FIRST
3516 020332                                SET     SPECIAL
3517 020340                                LET CSRINC := #10
3518 020346  000207                        RETURN
3519
3520                                    ;INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH EVEN DOUBLE WORDS SELECTED?)
3521 020350                        INT..3: LET CSRFBANK := FIRSTB
3522 020356                                IFB SIDE EQ #'0
3523 020366                                  LET CSRFIRST := #FIRST
3524 020374                                ELSE
3525 020376                                  LET CSRFIRST := #FIRST+10
3526 020404                                END ;OF IFB
3527 020404                                LET CSRINC := #20
3528 020412  000207                        RETURN
3529
3530                                    ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=0)
3531 020414                        INT..4: LET CSRFIRST := #FIRST
3532 020422                                SET     SPECIAL
3533 020430                                LET CSRINC := #20
3534 020436  000207                        RETURN
3535
3536                                    ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=0)
3537 020440                        INT..5: LET CSRFBANK := FIRSTB
3538 020446                                IFB SIDE EQ #'0
3539 020456                                  LET CSRFIRST := #FIRST
3540 020464                                ELSE
3541 020466                                  LET CSRFIRST := #FIRST+20
3542 020474                                END ;OF IFB
3543 020474                                LET CSRINC := #40
```

```
3544 020502  000207                    RETURN
3545
3546                                   ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02=0)
3547 020504                    INT..6: LET CSRFIRST := #FIRST+10
3548 020512                            SET     SPECIAL
3549 020520                            LET CSRINC := #20
3550 020526  000207                    RETURN
3551
3552                                   ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02=0)
3553 020530                    INT..7: LET CSRFBANK := FIRSTB
3554 020536                            IFB SIDE EQ #'0
3555 020546                              LET CSRFIRST := #FIRST+10
3556 020554                            ELSE
3557 020556                              LET CSRFIRST := #FIRST+30
3558 020564                            END ;OF IFB
3559 020564                            LET CSRINC := #40
3560 020572  000207                    RETURN
3561
3562                                   ;IMPOSSIBLE CONDITION
3563                                   ;NO INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3564 020574                    INT.10: ;FALL THRU TO INT.11
3565
3566                                   ;IMPOSSIBLE CONDITION
3567                                   ;INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3568 020574                    INT.11: IF FSINFLAG IS FALSE
3569 020602                              SET   FSINFLAG
3570 020610                              TYPE  MSG097
3571 020614                            END ;OF IF FSINFLAG
3572 020614                            GOTO    INT..1
3573
3574                                   ;NO INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3575 020616                    INT.12: LET CSRFIRST := #FIRST+4
3576 020624                            SET     SPECIAL
3577 020632                            LET CSRINC := #10
3578 020640  000207                    RETURN
3579
3580                                   ;INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3581 020642                    INT.13: LET CSRFBANK := FIRSTB
3582 020650                            IFB SIDE EQ #'0
3583 020660                              LET CSRFIRST := #FIRST+4
3584 020666                            ELSE
3585 020670                              LET CSRFIRST := #FIRST+14
3586 020676                            END ;OF IFB
3587 020676                            LET CSRINC := #20
3588 020704  000207                    RETURN
3589
3590                                   ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=1)
3591 020706                    INT.14: LET CSRFIRST := #FIRST+4
3592 020714                            SET     SPECIAL
3593 020722                            LET CSRINC := #20
3594 020730  000207                    RETURN
3595
3596                                   ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=1)
3597 020732                    INT.15: LET CSRFBANK := FIRSTB
3598 020740                            IFB SIDE EQ #'0
3599 020750                              LET CSRFIRST := #FIRST+4
3600 020756                            ELSE
```

```
3601 020760                                     LET CSRFIRST :- #FIRST+24
3602 020766                                   END ;OF IFB
3603 020766                                   LET CSRINC :- #40
3604 020774  000207                           RETURN
3605
3606                                          ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03-1,A02-1)
3607 020776                           INT.16: LET CSRFIRST := #FIRST+14
3608 021004                                   SET     SPECIAL
3609 021012                                   LET CSRINC :- #20
3610 021020  000207                           RETURN
3611
3612                                          ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02=1)
3613 021022                           INT.17: LET CSRFBANK := FIRSTB
3614 021030                                   IFB SIDE EQ #'0
3615 021040                                     LET CSRFIRST := #FIRST+14
3616 021046                                   ELSE
3617 021050                                     LET CSRFIRST :- #FIRST+34
3618 021056                                   END ;OF IFB
3619 021056                                   LET CSRINC :  #40
3620 021064  000207                           RETURN
3621
```

```
3624 021066                          SIDEOK: SUBTST  <<DETERMINE IF BANK BELONGS TO CORRECT SIDE>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       DETERMINE IF BANK BELONGS TO CORRECT SIDE
                                     ;*****************************************************************************
3625                                         ;RETURN ERROR IF NOT.
3626
3627 021066  005037  002404                 CLR     CHECK
3628 021072  013702  002336                 MOV     CSRFIRST,R2
3629 021076  104475                         CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
3630 021100                                 SUPERVISOR              ;ENTER SUPERVISOR MODE
3631 021106  104424                         CACHOFF                 ;TURN CACHE OFF
3632 021110  012722  000000                 MOV     #0,(R2)+
3633 021114  012712  000000                 MOV     #0,(R2)
3634 021120  104503                         CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3635 021122  005712                         TST     (R2)
3636 021124  104426                         READCSR
3637 021126  013701  002146                 MOV     CSR+2,R1
3638
3639                                         ;ELIMINATE DBE
3640 021132  104471                         ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
3641 021134  013712  002430                 MOV     ZEROS,(R2)
3642 021140  013742  002430                 MOV     ZEROS,-(R2)
3643 021144  104503                         CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3644 021146  104417                         KERNEL                  ;ENTER KERNEL MODE
3645 021150  104423                         CACHON                  ;TURN CACHE ON
3646
3647 021152                                 IF #BIT9 OFF.IN R1 AND SIDE EQ #'0 THEN $RETURN NOERROR
3648 021174                                 IF #BIT9 SET.IN R1 AND SIDE EQ #'1 THEN $RETURN NOERROR
3649 021216                                 $RETURN ERROR
```

```
3653 021222                          MKTEST: SUBTST  <<SUBR  MK11 TEST DISPATCH>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        SUBR    MK11 TEST DISPATCH
                                     ;*****************************************************************************
3654 021222                                  IF MULTIONLY IS TRUE THEN $RETURN
3655 021232                                  IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
3656 021250  104470                            ECCDIS                    ;DISABLE ERROR CORRECTION
3657 021252                                  ELSE
3658 021254  104502                            CLRCSR                    ;CLEAR MK11 CSRS
3659 021256                                  END ;OF IF
3660 021256  012737  000002  002100          MOV     #2,NOPAR            ;INDICATE PARITY ACTION
3661 021264  012737  000002  002406          MOV     #2,PCBUMP           ;TRAPS ADD 2 TO PC
3662 021272  013700  002120                  MOV     PATTERN,R0          ;GET PATTERN NUMBER
3663 021276  006300                          ASL     R0                  ;MAKE IT A WORD ADDRESS
3664 021300                                  IF MKPAT(R0) NE #MT0035 AND MKPAT(R0) NE #MT0999
3665 021320  104511                            INVALIDATE                ;INVALIDATE BACKGROUND PATTERN ON 'BANK''
3666 021322                                  END ;OF IF MKPAT(R0)
3667 021322  004770  021402                  CALL    @MKPAT(R0)          ;INDEX OFF TABLE
3668 021326                                  IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
3669 021344  104476                            WASSBE                    ;WAS THERE ANY SINGLE BIT ERRORS
3670 021346                                    ON.ERROR
3671 021350                                      SET SBEFLAG
3672 021356  013737  002144  002150              MOV CSR,SBECSR
3673 021364  013737  002146  002152              MOV CSR+2,SBECSR+2
3674 021372                                    END ;OF ON.ERROR
3675 021372                                  END ;OF IF #SW0
3676 021372  104472                            ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
3677 021374  005037  002100                  CLR     NOPAR               ;INDICATE PARITY ACTION
3678 021400  000207                          RETURN
3679
3680                                         ;WARNING IF YOU CHANGE THIS TABLE ALSO
3681                                         ;CHANGE '$DDW0'' - ''$DDW5'' (THE PATTERN BIT MAP)
3682
3683                                         ;PAT    TIME            DISCRIPTION
3684 021402                          MKPAT:  ;NOTE MT0035 MUST BE FIRST & LAST
3685 021402  025652                          MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
3686 021404  023134                          MT0017  ;<1 SEC         ;HOLDING 1'S & 0'S TEST
3687 021406  022414                          MT0007  ;<1 SEC         ;ADDRESS BIT TEST
3688 021410  021740                          MT0001  ;<1 SEC         ;ADDRESS TEST
3689 021412  022000                          MT0002  ;<1 SEC         ;COMPLEMENT ADDRESS TEST
3690 021414  022216                          MT0004  ; 1 SEC         ;ROTATING ZEROS TEST
3691 021416  022300                          MT0005  ; 1 SEC         ;ROTATING ONES TEST
3692 021420  023612                          MT0021  ; 1 SEC         ;MARCHING 0'S & 1'S TEST
3693 021422  023156                          MT0020  ;<1 SEC         ;MARCHING 1'S & 0'S IN CHECK BITS
3694 021424  023734                          MT0022  ;10 SEC         ;REFRESH & SHIFTING DIAGONAL  TEST
3695 021426  024240                          MT0026  ;<1 SEC         ;RANDOM DATA TEST
3696 021430  024032                          MT0024  ;20 SEC         ;FAST GALLOPING PATTERN TEST
3697 021432  025214                          MT0031  ; 3 SEC         ;SOB-A-LONG TEST
3698 021434  025340                          MT0033  ;<1 SEC         ;WRITE RECOVERY TEST
3699 021436  025530                          MT0034  ;35 SEC         ;BRANCH GOBBLE TEST
3700 021440  025652                          MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
3701                                         ;NOTE MT0035 MUST BE FIRST & LAST
3702 021442  025772                          MT0999  ; 0 SEC         ;NULL TEST
3703 021444  025772                          MT0999  ; 0 SEC         ;NULL TEST
3704 021446  025772                          MT0999  ; 0 SEC         ;NULL TEST
3705 021450  025772                          MT0999  ; 0 SEC         ;NULL TEST
3706 021452  025772                          MT0999  ; 0 SEC         ;NULL TEST
```

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3707 021454  025772                    MT0999  ; 0 SEC         ;NULL TEST
3708 021456  025772                    MT0999  ; 0 SEC         ;NULL TEST
3709 021460  025772                    MT0999  ; 0 SEC         ;NULL TEST
3710 021462  025772                    MT0999  ; 0 SEC         ;NULL TEST
3711 021464  025772                    MT0999  ; 0 SEC         ;NULL TEST
3712 021466  025772                    MT0999  ; 0 SEC         ;NULL TEST
3713 021470  025772                    MT0999  ; 0 SEC         ;NULL TEST
3714 021472  025772                    MT0999  ; 0 SEC         ;NULL TEST
3715 021474  025772                    MT0999  ; 0 SEC         ;NULL TEST
3716 021476  025772                    MT0999  ; 0 SEC         ;NULL TEST
3717 021500  025772                    MT0999  ; 0 SEC         ;NULL TEST
3718 021502  025772                    MT0999  ; 0 SEC         ;NULL TEST
3719 021504  025772                    MT0999  ; 0 SEC         ;NULL TEST
3720 021506  025772                    MT0999  ; 0 SEC         ;NULL TEST
3721 021510  025772                    MT0999  ; 0 SEC         ;NULL TEST
```

```
 3724 021512                            MJTEST: SUBTST  <<SUBR  MJ11 TEST DISPATCH>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    MJ11 TEST DISPATCH
                                        ;*****************************************************************************
 3725 021512                                    ; MULTIONLY IS TRUE THEN $RETURN
 3726 021522  012737  000002  002100            MOV     #2,NOPAR                ;INDICATE PARITY ACTION
 3727 021530  012737  000002  002406            MOV     #2,PCBUMP               ;TRAPS ADD 2 TO PC
 3728 021536  013700  002120                    MOV     PATTERN,R0              ;GET PATTERN NUMBER
 3729 021542  006300                            ASL     R0                      ;MAKE IT A WORD ADDRESS
 3730 021544                                    IF MJPAT(R0) NE #MT0035 AND MJPAT(R0) NE #MT0999
 3731 021564  104511                              INVALIDATE                    ;INVALIDATE BACKGROUND PATTERN ON 'BANK'
 3732 021566                                    END ;OF IF MJPAT(R0)
 3733 021566  004770  021600                    CALL    @MJPAT(R0)              ;INDEX OFF TABLE
 3734 021572  005037  002100                    CLR     NOPAR                   ;INDICATE PARITY ACTION
 3735 021576  000207                            RETURN
 3736
 3737                                           ;WARNING IF YOU CHANGE THIS TABLE ALSO
 3738                                           ;CHANGE '$DDW0' - '$DDW5' (THE PATTERN BIT MAP)
 3739
 3740                                           ;PAT    TIME            DISCRIPTION
 3741 021600                            MJPAT:  ;NOTE MT0035 MUST BE FIRST & LAST
 3742 021600  025652                            MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
 3743 021602  023134                            MT0017  ;<1 SEC         ;HOLDING 1'S & 0'S TEST
 3744 021604  022414                            MT0007  ;<1 SEC         ;ADDRESS BIT TEST
 3745 021606  021740                            MT0001  ;<1 SEC         ;ADDRESS TEST
 3746 021610  022000                            MT0002  ;<1 SEC         ;COMPLEMENT ADDRESS TEST
 3747 021612  022050                            MT0003  ; 1 SEC         ;3 XOR 9 WORST CASE NOISE TEST
 3748 021614  022216                            MT0004  ; 1 SEC         ;ROTATING ZEROS TEST
 3749 021616  022300                            MT0005  ; 1 SEC         ;ROTATING ONES TEST
 3750 021620  023612                            MT0021  ; 1 SEC         ;MARCHING 0'S & 1'S TEST
 3751 021622  023766                            MT0023  ;10 SEC         ;SHIFTING DIAGONAL  TEST
 3752 021624  024240                            MT0026  ;<1 SEC         ;RANDOM DATA TEST
 3753 021626  024032                            MT0024  ;20 SEC         ;FAST GALLOPING PATTERN TEST
 3754 021630  025214                            MT0031  ; 3 SEC         ;SOB-A-LONG TEST
 3755 021632  025340                            MT0033  ;<1 SEC         ;WRITE RECOVERY TEST
 3756 021634  025530                            MT0034  ;35 SEC         ;BRANCH GOBBLE TEST
 3757 021636  025652                            MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
 3758                                           ;NOTE MT0035 MUST BE FIRST & LAST
 3759 021640  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3760 021642  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3761 021644  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3762 021646  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3763 021650  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3764 021652  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3765 021654  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3766 021656  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3767 021660  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3768 021662  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3769 021664  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3770 021666  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3771 021670  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3772 021672  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3773 021674  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3774 021676  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3775 021700  025772                            MT0999  ; 0 SEC         ;NULL TEST
 3776 021702  025772                            MT0999  ; 0 SEC         ;NULL TEST
```

```
                                        .SBTTL  PATTERNS

                                        .SBTTL  MEMORY TEST SETUP ROUTINES
021704                          MT0000: SUBTST  <<MT0000        SETUP DATA PATTERN TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0000  SETUP DATA PATTERN TEST
                                ;*****************************************************************************
021704  005037  002366                  CLR     REALPAT         ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
021710  012700  060000                  MOV     #FIRST,R0
021714  012701  040000                  MOV     #SIZE,R1
021720  004737  035204                  CALL    REGCOPY
021724                                  BMOV    MTP000
021732  004737  026042                  CALL    SUPD01                  ;DO IT IN SUPERVISOR MODE
021736  000207                          RETURN
021740                          MT0001: SUBTST  <<MT0001        SETUP ADDRESS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0001  SETUP ADDRESS TEST
                                ;*****************************************************************************
021740  012737  000001  002366          MOV     #1,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
021746  012700  060000                  MOV     #FIRST,R0
021752  012701  040000                  MOV     #SIZE,R1
021756  005002                          CLR     R2
021760  004737  035204                  CALL    REGCOPY
021764                                  BMOV    MTP001
021772  004737  026042                  CALL    SUPD01                  ;DO IT IN SUPERVISOR MODE
021776  000207                          RETURN
022000                          MT0002: SUBTST  <<MT0002        SETUP COMPLEMENT ADDRESS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0002  SETUP COMPLEMENT ADDRESS TEST
                                ;*****************************************************************************
022000  012737  000002  002366          MOV     #2,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
022006  012700  160000                  MOV     #LAST+2,R0
022012  012701  040000                  MOV     #SIZE,R1
022016  012702  000001                  MOV     #1,R2
022022  010103                          MOV     R1,R3
022024  012704  060000                  MOV     #FIRST,R4
022030  012705  100001                  MOV     #100001,R5
022034                                  BMOV    MTP002
022042  004737  026042                  CALL    SUPD01
022046  000207                          RETURN
```

```
 381' 022050                            MT0003: SUBTST  <<MT0003        SETUP 3 XOR 9 WORST CASE NOISE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0003  SETUP 3 XOR 9 WORST CASE NOISE TEST
                                        ;*****************************************************************************
 3812 022050  012737  000003  002366          MOV     #3,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3813 022056  005037  002406                  CLR     PCBUMP                  ;TRAPS DO NOT ADD TO PC
 3814 022062  004737  035214          1$:     CALL    FLIPWARN                ;SETUP WARNING CONSTANTS & R2
 3815 022066  012701  060000          2$:     MOV     #FIRST,R1               ;R1 <-- STARTING ADDRESS
 3816 022072  005000                          CLR     R0                      ;INTERLEAVE ADDRESS CONSTANT
 3817 022074  160001                          SUB     R0,R1                   ;CORRECT FOR ADD BEFORE USE MODE
 3818 022076  012703  020000                  MOV     #SIZE/2,R3              ;INTERLEAVE SIZE (8K,4K,2K,OR 1K (DOUBLE WORDS))
 3819 022102  072327  177770                  ASH     #-8.,R3                 ;R3 <-- R3 / 256.
 3820 022106  012702  000004                  MOV     #4,R2                   ;SMALL LOOP SIZE
 3821 022112  012705  000100                  MOV     #64.,R5                 ;MEDIUM LOOP SIZE
 3822 022116                                  BMOV    MTPA03,UDPDR7,17.
 3823 022130  104415                          SAVREG
 3824 022132  012737  177636  002360          MOV     #FASTCITY-2,SUPDOADD
 3825 022140  004737  026220                  CALL    SUPD03
 3826 022144                                  BMOV    MTPB03
 3827 022152                                  BMOV    MTPC03,KDPAR0,8.
 3828 022164                                  BMOV    MTPD03,SDPAR0,8.
 3829 022176  104416                          RESREG
 3830 022200  004737  026056                  CALL    SUPD02
 3831 022204  022737  000003  002734          CMP     #3,FLIPLOC              ;DONE WITH 4 PATTERNS
 3832                                                                         ;[(0,177777);(177777,0);(401,177777);(177777,401)]?
 3833 022212  001323                          BNE     1$                      ;NO - LOOP
 3834 022214  000207                          RETURN
 3835
 3836 022216                            MT0004: SUBTST  <<MT0004        SETUP ROTATING ZEROS TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0004  SETUP ROTATING ZEROS TEST
                                        ;*****************************************************************************
 3837 022216  012737  000004  002366          MOV     #4,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3838 022224  012737  000004  002406          MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 3839 022232  013702  002726                  MOV     ONES,R2
 3840 022236  004737  035344                  CALL    BACKGND                 ;WRITE BACKGROUND OF ONES
 3841 022242  012700  060000                  MOV     #FIRST,R0
 3842 022246  012701  040000                  MOV     #SIZE,R1
 3843 022252                                  BMOV    MTPA04
 3844 022260                                  BMOV    MTPB04,KDPAR0,8.
 3845 022272  004737  026056                  CALL    SUPD02
 3846 022276  000207                          RETURN
 3847 022300                            MT0005: SUBTST  <<MT0005        SETUP ROTATING ONES TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0005  SETUP ROTATING ONES TEST
                                        ;*****************************************************************************
 3848 022300  012737  000005  002366          MOV     #5,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3849 022306  012737  000004  002406          MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 3850 022314  005002                          CLR     R2
 3851 022316  004737  035344                  CALL    BACKGND                 ;WRITE BACKGROUND OF ZEROS
 3852 022322  012700  060000                  MOV     #FIRST,R0
 3853 022326  012701  040000                  MOV     #SIZE,R1
 3854 022332                                  BMOV    MTP005
 3855 022340                                  BMOV    MTPB04,KDPAR0,8.
 3856 022352  004737  026056                  CALL    SUPD02
 3857 022356  000207                          RETURN
```

```
                                        MT0006: SUBTST  <<MT0006        SETUP INITIAL DATA TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MT0006  SETUP INITIAL DATA TEST
                                        ;*****************************************************************************
3861 022360  012737  000006  002366            MOV     #6,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3862 022366  012737  000004  002406            MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
3863 022374  013701  002506                    MOV     TESTADD,R1
3864 022400  012737  026760  002360            MOV     #MTP006,SUPDOADD
3865 022406  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3866 022412  000207                            RETURN
3867 022414                             MT0007: SUBTST  <<MT0007        SETUP ADDRESS BIT TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MT0007  SETUP ADDRESS BIT TEST
                                        ;*****************************************************************************
3868 022414  012737  000007  002366            MOV     #7,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3869 022422  005002                            CLR     R2
3870 022424  004737  035344                    CALL    BACKGND                 ;OF ZEROS
3871 022430  012701  060000                    MOV     #FIRST,R1
3872 022434  012702  000001                    MOV     #1,R2
3873 022440  050201                            BIS     R2,R1
3874 022442  012737  027150  002360            MOV     #MTP007,SUPDOADD
3875 022450  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3876 022454  000207                            RETURN
3877 022456                             MT0010: SUBTST  <<MT0010        SETUP BYTE ADDRESSING TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MT0010  SETUP BYTE ADDRESSING TEST
                                        ;*****************************************************************************
3878 022456  012737  000010  002366            MOV     #10,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3879 022464  012737  000004  002406            MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
3880 022472  013704  002506                    MOV     TESTADD,R4
3881 022476  012737  027250  002360            MOV     #MTP010,SUPDOADD
3882 022504  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3883 022510  000207                            RETURN
```

```
3886 022512                          MT0011: SUBTST  <<MT0011        SETUP CREATE SINGLE BIT ERROR TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MT0011  SETUP CREATE SINGLE BIT ERROR TEST
                                     ;*****************************************************************************
3887 022512                                  IF NOECCFLAG IS TRUE THEN $RETURN
3888 022522                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
3889 022536                                    IF $PASS NE #0 THEN $RETURN
3890 022546                                  END ;OF IF ACTFLAG
3891 022546  012737  000011  002366          MOV     #11,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3892 022554  012737  027356  002360          MOV     #MTP011,SUPDOADD
3893 022562  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3894 022566  000207                        RETURN
3895 022570                          MT0012: SUBTST  <<MT0012        SETUP WRITE BYTE CLEARS SBE TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MT0012  SETUP WRITE BYTE CLEARS SBE TEST
                                     ;*****************************************************************************
3896 022570                                  IF NOECCFLAG IS TRUE THEN $RETURN
3897 022600                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
3898 022614                                    IF $PASS NE #0 THEN $RETURN
3899 022624                                  END ;OF IF ACTFLAG
3900 022624  012737  000012  002366          MOV     #12,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3901 022632  012737  027766  002360          MOV     #MTP012,SUPDOADD
3902 022640  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3903 022644  000207                        RETURN
3904 022646                          MT0013: SUBTST  <<MT0013        SETUP CREATE DOUBLE BIT ERROR TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MT0013  SETUP CREATE DOUBLE BIT ERROR TEST
                                     ;*****************************************************************************
3905 022646                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
3906 022662                                    IF $PASS NE #0 THEN $RETURN
3907 022672                                  END ;OF IF ACTFLAG
3908 022672  012737  000013  002366          MOV     #13,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3909 022700  012737  030344  002360          MOV     #MTP013,SUPDOADD
3910 022706  012737  000003  002100          MOV     #3,NOPAR                ;INDICATE PARITY ACRION
3911 022714  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3912 022720  000207                        RETURN
3913 022722                          MT0014: SUBTST  <<MT0014        SETUP WRITE INHIBIT DURING DATIP WITH DBE>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MT0014  SETUP WRITE INHIBIT DURING DATIP WITH DBE
                                     ;*****************************************************************************
3914 022722                                  IF NOECCFLAG IS TRUE THEN $RETURN
3915 022732                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
3916 022746                                    IF $PASS NE #0 THEN $RETURN
3917 022756                                  END ;OF IF ACTFLAG
3918 022756  012737  000014  002366          MOV     #14,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3919 022764  012737  030716  002360          MOV     #MTP014,SUPDOADD
3920 022772  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3921 022776  000207                        RETURN
```

```
 3924 023000                                MT0015: SUBTST  <<MT0015        SETUP WRITE INHIBIT OF BYTE WITH DBE>>
                                            ;*********************************************************************************
                                            ;*SUBTEST        MT0015  SETUP WRITE INHIBIT OF BYTE WITH DBE
                                            ;*********************************************************************************
 3925 023000                                        IF NOECCFLAG IS TRUE THEN $RETURN
 3926 023010                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 3927 023024                                          IF $PASS NE #0 THEN $RETURN
 3928 023034                                        END ;OF IF ACTFLAG
 3929 023034  012737  000015  002366                MOV     #15,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3930 023042  012737  031312  002360                MOV     #MTP015,SUPDOADD
 3931 023050  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3932 023054  000207                                RETURN
 3933 023056                                MT0016: SUBTST  <<MT0016        SETUP WRITE INHIBIT OF WORD WITH DBE>>
                                            ;*********************************************************************************
                                            ;*SUBTEST        MT0016  SETUP WRITE INHIBIT OF WORD WITH DBE
                                            ;*********************************************************************************
 3934 023056                                        IF NOECCFLAG IS TRUE THEN $RETURN
 3935 023066                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 3936 023102                                          IF $PASS NE #0 THEN $RETURN
 3937 023112                                        END ;OF IF ACTFLAG
 3938 023112  012737  000016  002366                MOV     #16,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3939 023120  012737  031700  002360                MOV     #MTP016,SUPDOADD
 3940 023126  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3941 023132  000207                                RETURN
 3942 023134                                MT0017: SUBTST  <<MT0017        SETUP HOLDING 1'S & 0'S>>
                                            ;*********************************************************************************
                                            ;*SUBTEST        MT0017  SETUP HOLDING 1'S & 0'S
                                            ;*********************************************************************************
 3943 023134  012737  000017  002366                MOV     #17,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3944 023142  012737  032302  002360                MOV     #MTP017,SUPDOADD
 3945 023150  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3946 023154  000207                                RETURN
```

```
3949 023156                                MT0020: SUBTST  <<MT0020        SETUP MARCHING 0'S & 1'S IN CHECKBITS TEST>>
                                           ;*********************************************************************
                                           ;*SUBTEST       MT0020  SETUP MARCHING 0'S & 1'S IN CHECKBITS TEST
                                           ;*********************************************************************
3950 023156                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
3951 023172                                          IF $PASS NE #0 THEN $RETURN
3952 023202                                        END ;OF IF ACTFLAG
3953 023202  012737  000020  002366                MOV     #20,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3954 023210  005037  002100                        CLR     NOPAR           ;INDICATE PARITY ACTION
3955 023214  012737  032572  002360                MOV     #MTPA20,SUPDOADD
3956 023222  0137 .  002334                        MOV     MKCSRS,R0
3957 023226                                        FOR MTV020 := #0 TO #34 BY #4
3958 023232  013737  023320  002256                  MOV   MTV020,CSRNO
3959 023240  106300                                  ASLB  R0
3960 023242                                          ON.ERROR
3961 023244  112737  000060  002422                    MOVB        #'0,SIDE
3962 023252  004737  0'7610                          CALL        INTKRAP
3963 023256                                          IF SPECIAL IS FALSE
3964 023264  006237  002414                            ASR       CSRINC
3965 023270                                          END ;OF IF SPECIAL
3966                                                  ;NOW CSRFIRST & CSRINC ARE SETUP
3967 023270                                          PUSH        R0
3968 023272  004737  023322                          CALL        MT020Z
3969 023276                                          POP         R0
3970 023300                                        END ;OF ON.ERROR
3971 023300                                        END ;OF FOR CSRNO
3972 023316  000207                                RETURN
3973 023320  000000                        MTV020: 0                               ;VARIABLE FOR PAT 20
3974
3975 023322  013700  002336                MT020Z: MOV     CSRFIRST,R0
3976 023326  010001                                MOV     R0,R1
3977 023330  013702  002414                        MOV     CSRINC,R2
3978 023334  005003                                CLR     R3
3979 023336  012704  100000                        MOV     #BIT15,R4
3980 023342  012705  160000                        MOV     #LAST+2,R5
3981 023346  104503                                CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3982 023350                                        BMOV    MTP20A
3983 023356  004737  026042                        CALL    SUPD01
3984 023362                                        IF #SW11 SET.IN @SWR OR QVFLAG IS TRUE
3985 023400                                          GOTO  MT020Y
3986 023402                                        END ;OF IF #SW11
3987 023402                                        BMOV    MTP20B
3988 023410  004737  026056                        CALL    SUPD02
3989 023414                                        IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
3990 023432  104477                                  WAS1SBE                       ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
3991 023434                                          ON.ERROR THEN GOTO MT020X
3992 023436                                        END ;OF IF #SW0
3993 023436                                        BMOV    MTP20C
3994 023444  004737  026056                        CALL    SUPD02
3995 023450                                        IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
3996 023466  104477                                  WAS1SBE                       ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
3997 023470                                          ON.ERROR THEN GOTO MT020X
3998 023472                                        END ;OF IF #SW0
3999 023472  0'3701  002336                MT020Y: MOV     CSRFIRST,R1
4000 023476                                        BMOV    MTP20D
4001 023504  004737  026056                        CALL    SUPD02
4002 023510                                        IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
```

```
4003 023526  104477                          WAS1SBE                          ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
4004 023530                                  ON.ERROR THEN GOTO MT020X
4005 023532                                END ;OF IF #SW0
4006 023532                                BMOV    MTP20E
4007 023540  004737  026056                CALL    SUPD02
4008 023544                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
4009 023562  104477                          WAS1SBE                          ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
4010 023564                                  ON.ERROR THEN GOTO MT020X
4011 023566                                END ;OF IF #SW0
4012 023566                                BMOV    MTP20F
4013 023574  004737  026056                CALL    SUPD02
4014 023600  104503                        CLR1CSR                  ;CLEAR 1 SELECTED MK11 CSR
4015 023602  000207                        RETURN
4016
4017 023604  004737  026234      MT020X:   CALL    SUPD04
4018 023610  000207                        RETURN
```

```
4021 023612                            MT0021: SUBTST  <<MT0021        SETUP MARCHING 0'S & 1'S TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0021  SETUP MARCHING 0'S & 1'S TEST
                                       ;*****************************************************************************
4022 023612                                    SET NOSCOPE
4023 023620  012737  000021  002366            MOV     #21,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4024 023626  013702  002762                    MOV     BAKPAT,R2
4025 023632  004737  035344                    CALL    BACKGND
4026 023636  010203                            MOV     R2,R3
4027 023640  000303                            SWAB    R3
4028 023642  012701  160000                    MOV     #LAST+2,R1
4029 023646  010105                            MOV     R1,R5
4030 023650  012704  060000                    MOV     #FIRST,R4
4031 023654                                    BMOV    MTPA21
4032 023662  004737  026042                    CALL    SUPD01
4033
4034 023666                                    BMOV    MTPB21
4035 023674  004737  026056                    CALL    SUPD02
4036
4037 023700  010401                            MOV     R4,R1
4038 023702                                    BMOV    MTPC21
4039 023710  004737  026056                    CALL    SUPD02
4040
4041 023714                                    BMOV    MTPD21
4042 023722  004737  026056                    CALL    SUPD02
4043 023726  005037  002540                    CLR     NOSCOPE
4044 023732  000207                            RETURN
4045
4046 023734                            MT0022: SUBTST  <<MT0022        SETUP REFRESH & SHIFTING DIAGONAL TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0022  SETUP REFRESH & SHIFTING DIAGONAL TEST
                                       ;*****************************************************************************
4047 023734  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
4048 023740                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
4049 023744  012737  000022  002366            MOV     #22,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4050 023752  012737  033404  002360            MOV     #MTP022,SUPDOADD
4051 023760  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
4052 023764  000207                            RETURN
4053
4054 023766                            MT0023: SUBTST  <<MT0023        SHIFTING DIAGONAL TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0023  SHIFTING DIAGONAL TEST
                                       ;*****************************************************************************
4055 023766  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
4056 023772                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
4057 023776  012737  000023  002366            MOV     #23,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4058 024004  012737  033404  002360            MOV     #MTP022,SUPDOADD
4059 024012                                    SET     DIAGFLAG                ;IDENTIFY DIAGONAL TEST TO MTP022
4060 024020  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
4061 024024  005037  002006                    CLR     DIAGFLAG
4062 024030  000207                            RETURN
```

```
 4064 024032                            MT0024: SUBTST  <<MT0024        SETUP FAST GALLOPING PATTERN TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0024  SETUP FAST GALLOPING PATTERN TEST
                                        ;*****************************************************************************
 4065 024032  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4066 024036                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
 4067 024042                                    SET     NOSCOPE
 4068 024050  012737  000024  002366            MOV     #24,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4069 024056  013702  002762                    MOV     BAKPAT,R2
 4070 024062  004737  035344                    CALL    BACKGND
 4071 024066  010203                            MOV     R2,R3
 4072 024070  010304                            MOV     R3,R4
 4073 024072  000304                            SWAB    R4
 4074 024074  012701  060000                    MOV     #FIRST,R1
 4075 024100  012705  157776                    MOV     #LAST,R5
 4076 024104  104415                            SAVREG
 4077 024106                                    BMOV    MTPA24
 4078 024114                                    BMOV    MTPB24,SDPAR0,8.
 4079 024126                                    BMOV    MTPC24,KDPAR0,8.
 4080 024140  012737  172260  002360            MOV     #SDPAR0,SUPDOADD
 4081 024146  004737  026234                    CALL    SUPD04
 4082
 4083                                           ;DO IT AGAIN FOR COMPLEMENT DATA
 4084 024152  104416                            RESREG
 4085 024154  000302                            SWAB    R2
 4086 024156  000303                            SWAB    R3
 4087 024160  004737  026234                    CALL    SUPD04
 4088 024164  005037  002540                    CLR     NOSCOPE
 4089 024170  000207                            RETURN
 4090 024172                            MT0025: SUBTST  <<MT0025        SETUP INTERRUPT ENABLE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0025  SETUP INTERRUPT ENABLE TEST
                                        ;*****************************************************************************
 4091 024172                                    IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
 4092 024206                                      IF $PASS NE #0 THEN $RETURN
 4093 024216                                    END ;OF IF ACTFLAG
 4094 024216  012737  000025  002366            MOV     #25,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4095 024224  012737  034152  002360            MOV     #MTP025,SUPDOADD
 4096 024232  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 4097 024236  000207                            RETURN
```

```
 4100 024240                            MT0026: SUBTST  <<MT0026        SETUP RANDOM DATA TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0026  SETUP RANDOM DATA TEST
                                        ;*****************************************************************************
                                        ;
 4101 024240  012737  000026  002366            MOV     #26,REALPAT
 4102 024246  005037  002406                    CLR     PCBUMP                  ;TRAPS DO NOT ADD TO THE PC
 4103 024252  013703  002716                    MOV     SEEDLO,R3               ;INITIALIZE RANDOM NUMBERS
 4104 024256  013702  002714                    MOV     SEEDHI,R2
 4105 024262  010305                            MOV     R3,R5
 4106 024264  010204                            MOV     R2,R4
 4107 024266  012701  060000                    MOV     #FIRST,R1
 4108 024272  012700  020000                    MOV     #SIZE/2,R0
 4109 024276  104415                            SAVREG
 4110 024300                                    BMOV    MTPA26                  ;WRITE ROUTINE TO FAST MEMORY
 4111 024306                                    BMOV    MTPC26,KDPAR0,8.        ;RANDOM SUBPROGRAM TO FAST MEMORY
 4112 024320                                    BMOV    MTPD26,SDPAR0,8.        ;RANDOM SUBSUBPROGRAM TO FAST MEMORY
 4113 024332  004737  026042                    CALL    SUPD01                  ;WRITE RANDOM DATA
 4114 024336  005037  034626                    CLR     RANODD                  ;FOR ERROR REPORTING
 4115 024342                                    BMOV    MTPB26                  ;READ ROUTINE TO FAST MEMORY
 4116 024350  104416                            RESREG
 4117 024352  004737  026042                    CALL    SUPD01                  ;READ RANDOM DATA
 4118 024356  010337  002716                    MOV     R3,SEEDLO               ;UPDATE FOR NEW RANDOM NUMBERS
 4119 024362  010237  002714                    MOV     R2,SEEDHI
 4120 024366  000207                            RETURN
```

```
4123 024370                          MT0027: SUBTST  <<MT0027        UNIQUE BANK TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MT0027  UNIQUE BANK TEST
                                     ;*****************************************************************************
4124                                         ;MAKE SURE THAT EACH BANK CAN HAVE UNIQUE DATA
4125                                         ;WRITE AND READ THE BANK NUMBER IN EACH BANK (EXCEPT WHERE THE PROGRAM IS)
4126 024370  012737  000027  002366          MOV     #27,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4127 024376                                  CLEAR   MARGIN,MAINT            ;CLEAR MARGINS
4128 024406  104502                          CLRCSR                          ;CLEAR MK11 CSRS
4129 024410                                  BMOV    MTP000
4130 024416  012737  000207  177644  WARN7:  MOV     #207,UIPAR2             ;PUT 'RETURN' INSTRUCTION AFTER WRITE ROUTINE
4131 024424  012737  177646  002360          MOV     #UIPAR3,SUPDOADD
4132 024432                                  SET NOFSMODE
4133 024440                                  FOR I := #1 TO #2
4134 024446                                    FOR BANK := #0 TO #167
4135 024452  004737  :2422                      CALL EXBANK
4136 024456                                     IF ACFLAG IS TRUE AND RRFLAG IS FALSE
4137 024472  104511                              INVALIDATE                  ;INVALIDATE BACKGROUND PATTERN ON 'BANK'
4138 024474                                      LET R2 := BANK
4139 024500  012700  060000                      MOV       #FIRST,R0
4140 024504  010004                              MOV       R0,R4
4141 024506  012701  040000                      MOV       #SIZE,R1
4142 024512  010103                              MOV       R1,R3
4143 024514                                      IF I EQ #1
4144 024524  004737  026042                        CALL    SUPDO1
4145 024530                                      END ;OF IF
4146 024530                                      IF I EQ #2
4147 024540  004737  026220                        CALL    SUPDO3
4148 024544                                      END ;OF IF
4149 024544                                     END ;OF IF
4150 024544                                   END ;OF FOR BANK
4151 024560                                 END ;OF FOR I
4152 024574                                 IF FS7FLAG IS TRUE
4153 024602  005037  002526                    CLR   NOFSMODE
4154 024606  000207                            RETURN
4155 024610                                 END ;OF IF FS7FLAG
4156 024610                                 FOR I := #1 TO #2
4157 024616                                   FOR BANK := #167 DOWNTO #0
4158 024624  004737  042422                      CALL EXBANK
4159 024630                                      IF ACFLAG IS TRUE AND RRFLAG IS FALSE
4160 024644                                        LET R2 := BANK
4161 024650  005102                                COM       R2
4162 024652  012700  060000                      MOV       #FIRST,R0
4163 024656  010004                              MOV       R0,R4
4164 024660  012701  040000                      MOV       #SIZE,R1
4165 024664  010103                              MOV       R1,R3
4166 024666                                      IF I EQ #1
4167 024676  004737  026042                        CALL    SUPDO1
4168 024702                                      END ;OF IF
4169 024702                                      IF I EQ #2
4170 024712  004737  026220                        CALL    SUPDO3
4171 024716                                      END ;OF IF
4172 024716                                     END ;OF IF
4173 024716                                   END ;OF FOR BANK
4174 024732                                 END ;OF FOR I
4175 024746  005037  002526                    CLR     NOFSMODE
4176 024752  000207                          RETURN
```

```
4179 024754                                MT0030: SUBTST  <<MT0030        SETUP FLUSH OUT DBE'S TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MT0030  SETUP FLUSH OUT DBE'S TEST
                                           ;*****************************************************************************
4180 024754  005037  002362                        CLR     PASFLG
4181 024760  012737  000030  002366  MTA030: MOV     #30,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4182 024766                                CLEAR   MARGIN,MAINT            ;CLEAR MARGINS
4183 024776  012737  000001  002100        MOV     #1,NOPAR                ;INDICATE COUNT PARITY ERRORS
4184 025004                                BMOV    MTP030
4185 025012  104470                        ECCDIS                  ;DISABLE ERROR CORRECTION
4186 025014                                SET     NOFSMODE,NOSCOPE
4187 025030                                FOR BANK := #0 TO #167
4188 025034  004737  042422                  CALL  EXBANK
4189 025040                                  IF MKFLAG IS TRUE
4190 025046                                    IF ACFLAG IS TRUE AND RRFLAG IS FALSE
4191 025062  012701  040000                      MOV       #SIZE,R1
4192 025066  012700  060000                      MOV       #FIRST,R0
4193 025072  004737  026042                      CALL      SUPD01
4194 025076                                    END ;OF IF ACFLAG
4195 025076                                  END ;OF IF MKFLAG
4196 025076                                END ;OF FOR
4197 025112                                IF PASFLG IS FALSE
4198 025120                                  SET PASFLG
4199 025126  104502                          CLRCSR                          ;CLEAR MK11 CSRS
4200 025130  004737  041130                  CALL  RELOCATE
4201 025134                                  ON.ERROR
4202 025136  104472                            ECCINIT             ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
4203 025140                                    CLEAR       NOFSMODE,NOSCOPE
4204 025150  000207                            RETURN
4205 025152                                  END ;OF ON.ERROR
4206 025152  013737  002400  002106          MOV   NEWBANK,BANK
4207 025160  004737  042422                  CALL  EXBANK
4208 025164  004737  024760                  CALL  MTA030
4209 025170  104472                          ECCINIT                 ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
4210 025172  004737  041604                  CALL  UNRELOCATE
4211 025176  000207                          RETURN
4212 025200                                END ;OF IF PASFLG
4213 025200  104472                        ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
4214 025202                                CLEAR   NOFSMODE,NOSCOPE
4215 025212  000207                        RETURN
```

```
 4218 025214                            MT0031: SUBTST  <<MT0031        SETUP SOB-A-LONG TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MT0031  SETUP SOB-A-LONG TEST
                                        ;*********************************************************************
 4219 025214  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4220 025220                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
 4221 025224                                    SET     NOSCOPE
 4222 025232  012737  000031  002366            MOV     #31,REALPAT             ;SETUP PATTERN NUMBER FOR TYPFOUT & DISPLAY
 4223 025240  005037  002100                    CLR     NOPAR                   ;SETUP PARITY ACTION
 4224 025244                                    MAP     BANK                    ;MAP FIRST SO BLOCK MOVE WORKS
 4225 025260                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
 4226 025266                                    BMOV    MTP031,FIRST,SOBLENGTH/2
 4227 025300  104417                            KERNEL                  ;ENTER KERNEL MODE
 4228 025302  013702  002704                    MOV     SOBK,R2
 4229 025306  010200                            MOV     R2,R0
 4230 025310  012701  100776                    MOV     #100776,R1              ;COMPLEMENT OF INSTRUCTION "SOB R0,DOT"
 4231 025314  012705  060056                    MOV     #FIRST+SOBLENGTH,R5
 4232 025320  012737  060002  002360            MOV     #FIRST+2,SUPDOADD
 4233 025326  004737  026234                    CALL    SUPD04
 4234 025332  005037  002540                    CLR     NOSCOPE
 4235 025336  000207                           RETURN
```

```
 4238 025340                            MT0033: SUBTST  <<MT0033        SETUP WRITE RECOVERY TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0033  SETUP WRITE RECOVERY TEST
                                        ;*****************************************************************************
 4239 025340  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4240 025344                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
 4241 025350                                    SET     NOSCOPE
 4242 025356  012737  000033  002366            MOV     #33,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4243 025364  005037  002100                    CLR     NOPAR                   ;SETUP PARITY ACTION
 4244 025370                                    MAP     BANK                    ;MAP FIRST SO THAT THE BLOCK MOVE WORKS
 4245 025404  012700  010247                    MOV     #10247,R0               ;OPP CODE OF INSTRUCTION 'MOV   R2,-(PC)'
 4246 025410  012701  177667                    MOV     #177667,R1              ;OPP CODE OF COMPLEMENT OF INSTRUCTION 'JMP (R0)'
 4247 025414  012702  020000                    MOV     #SIZE/2,R2              ;USED FOR 1/2 BANK LOOP
 4248 025420  012703  060000                    MOV     #FIRST,R3
 4249 025424  012704  160000                    MOV     #LAST+2,R4
 4250
 4251 025430                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
 4252                                           ;MOVE TEST TO MEMORY UNDER TEST
 4253 025436  010023                    1$:     MOV     R0,(R3)+
 4254 025440  010144                            MOV     R1,-(R4)
 4255 025442  077203                            SOB     R2,1$
 4256
 4257                                           ;MOVE LAST PART OF TEST TO FASTCITY
 4258 025444                                    BMOV    MTP033
 4259 025452  104417                            KERNEL                  ;ENTER KERNEL MODE
 4260
 4261 025454  012702  005141                    MOV     #5141,R2                ;OPP CODE OF INSTRUCTION 'COM   -(R1)'
 4262 025460  012700  025526                    MOV     #2$,R0                  ;ADDRESS TO RETURN TO IN R0
 4263 025464  012701  160000                    MOV     #LAST+2,R1              ;TOP OF BANK
 4264 025470  012737  060000  002360            MOV     #FIRST,SUPD0ADD
 4265 025476  004737  026234                    CALL    SUPD04
 4266 025502  012703  020000                    MOV     #SIZE/2,R3
 4267 025506  012705  000110                    MOV     #110,R5
 4268 025512  012704  060000                    MOV     #FIRST,R4
 4269 025516  004737  026056                    CALL    SUPD02
 4270 025522  005037  002540                    CLR     NOSCOPE
 4271 025526  000207                    2$:     RETURN                  ;THIS RETURN ACTS AS A NORMAL RETURN FROM MT0033
 4272                                                                   ;ALSO A RETURN FROM THE 'CALL   SUPD04' ABOVE
 4273
```

```
 4276 025530                            MT0034: SUBTST  <<MT0034        SETUP BRANCH GOBBLE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0034  SETUP BRANCH GOBBLE TEST
                                        ;*****************************************************************************
 4277 025530  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4278 025534                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
 4279 025540                                    SET     NOSCOPE
 4280 025546  012737  000034  002366            MOV     #34,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4281 025554  005037  002100                    CLR     NOPAR                   ;SETUP PARITY ACTION
 4282 025560                                    MAP     BANK                    ;MAP FIRST SO THAT BLOCK MOVE WORKS
 4283
 4284 025574                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
 4285 025602                                    BMOV    MTP034,FIRST,GBLENGTH/2
 4286 025614  104417                            KERNEL                  ;ENTER KERNEL MODE
 4287
 4288 025616  012705  060076                    MOV     #FIRST+GBLENGTH,R5
 4289 025622  012737  060004  002360            MOV     #FIRST+4,SUPDOADD
 4290 025630  012701  060002                    MOV     #FIRST+2,R1
 4291 025634  012702  060003                    MOV     #FIRST+3,R2
 4292
 4293 025640  004737  026234                    CALL    SUPD04
 4294 025644  005037  002540                    CLR     NOSCOPE
 4295 025650  000207                            RETURN
 4296
 4297 025652                            MT0035: SUBTST  <<MT0035        SOFT ERROR - BACKGROUND PATTERN TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0035  SOFT ERROR - BACKGROUND PATTERN TEST
                                        ;*****************************************************************************
 4298 025652  012737  000035  002366            MOV     #35,REALPAT
 4299 025660  012700  060000                    MOV     #FIRST,R0
 4300 025664  012701  040000                    MOV     #SIZE,R1
 4301 025670  013702  002744                    MOV     SOFTPAT,R2
 4302 025674  010103                            MOV     R1,R3
 4303 025676  013705  002106                    MOV     BANK,R5
 4304 025702  070527  000006                    MUL     #6,R5
 4305 025706  010004                            MOV     R0,R4
 4306 025710                                    BMOV    MTP000
 4307 025716  012737  000207  177644            MOV     #207,UIPAR2             ;PUT RETURN INSTRUCTION AFTER WRITE ROUTINE
 4308 025724  012737  177646  002360            MOV     #UIPAR3,SUPDOADD
 4309 025732                                    IF #BIT13 SET.IN CONFIG+2(R5) AND WRITEONLY IS FALSE
 4310                                              ;BACKGROUND PATTERN IS VALID
 4311 025750  004737  026220                      CALL  SUPD03                  ;READ IT
 4312 025754                                    ELSE
 4313                                              ;BACKGROUND PATTERN HAS BEEN INVALIDATED
 4314 025756  004737  026042                      CALL  SUPD01                  ;WRITE IT
 4315 025762  052765  020000  003020              BIS   #BIT13,CONFIG+2(R5)     ;VALIDATE IT
 4316 025770                                    END ;OF IF #BIT13
 4317 025770  000207                            RETURN
```

```
 4320 025772                        MT0999: SUBTST  <<MT0999        SETUP NULL TEST>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       MT0999  SETUP NULL TEST
                                    ;*****************************************************************************
 4321 025772  005037  002366                CLR     REALPAT
 4322 025776                                SET     NULLFLAG
 4323 026004  000207                        RETURN
 4324
 4325 026006                        KAMITEST:SUBTST <<CHECK FOR KAMIKAZE MODE>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       CHECK FOR KAMIKAZE MODE
                                    ;*****************************************************************************
 4326 026006                                IF KAMIKAZE IS TRUE OR ACTFLAG IS TRUE OR APTFLAG IS TRUE
 4327 026030                                  $RETURN NOERROR                ;RUN THE TEST
 4328 026034                                ELSE
 4329 026036                                  $RETURN ERROR                  ;DON'T RUN THE TEST
 4330 026042                                END ;OF IF KAMIKAZE
```

```
4334 026040                                SUPD01: SUBTST  <<SUBR  EXECUTE PATTERN IN SUPERVISOR>>
                                           ;*********************************************************************
                                           ;*SUBTEST        SUBR    EXECUTE PATTERN IN SUPERVISOR
                                           ;*********************************************************************
4335 026042                                        MAP     BANK                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
4336 026056  004737  066514                SUPD02: CALL    GETDIS
4337 026062                                        PUSH    $LPERR,$LPADR
4338 026072  010037  002266                        MOV     R0,SUPDR0
4339 026076  012700  002270                        MOV     #SUPDR1,R0
4340 026102  010120                                MOV     R1,(R0)+
4341 026104  010220                                MOV     R2,(R0)+
4342 026106  010320                                MOV     R3,(R0)+
4343 026110  010420                                MOV     R4,(R0)+
4344 026112  010520                                MOV     R5,(R0)+
4345 026114  010620                                MOV     SP,(R0)+
4346 026116  013700  002266                        MOV     SUPDR0,R0
4347 026122  012737  026136  002746                MOV     #TAG4$,$LPADR
4348 026130  013737  002746  002750                MOV     $LPADR,$LPERR
4349 026136  012700  002304                TAG4$:  MOV     #SUPDR6+2,R0
4350 026142  014006                                MOV     -(R0),SP
4351 026144  014005                                MOV     -(R0),R5
4352 026146  014004                                MOV     -(R0),R4
4353 026150  014003                                MOV     -(R0),R3
4354 026152  014002                                MOV     -(R0),R2
4355 026154  014001                                MOV     -(R0),R1
4356 026156  014000                                MOV     -(R0),R0
4357 026160                                        SUPERVISOR                  ;ENTER SUPERVISOR MODE
4358 026166  012706  000740                        MOV     #SUPSTK,SSP
4359 026172  104424                                CACHOFF                     ;TURN CACHE OFF
4360 026174  004737  177640                        CALL    FASTCITY                    ;CALL TO THE USER INSTRUCTION PAR'S
4361 026200  104423                                CACHON                      ;TURN CACHE ON
4362 026202  104417                                KERNEL                      ;ENTER KERNEL MODE
4363 026204  000004                                SCOPE
4364 026206                                        POP     $LPADR,$LPERR
4365 026216  000207                                RETURN
```

```
 4369 026220                                SUPD03: MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
 4370 026234  004737  066514                SUPD04: CALL    GETDIS
 4371 026240                                        PUSH    $LPERR,$LPADR
 4372 026250  010037  002266                        MOV     R0,SUPDR0
 4373 026254  012700  002270                        MOV     #SUPDR1,R0
 4374 026260  010120                                MOV     R1,(R0)+
 4375 026262  010220                                MOV     R2,(R0)+
 4376 026264  010320                                MOV     R3,(R0)+
 4377 026266  010420                                MOV     R4,(R0)+
 4378 026270  010520                                MOV     R5,(R0)+
 4379 026272  010620                                MOV     SP,(R0)+
 4380 026274  013700  002266                        MOV     SUPDR0,R0
 4381 026300  012737  026314  002746                MOV     #TBG4$,$LPADR
 4382 026306  013737  002746  002750                MOV     $LPADR,$LPERR
 4383 026314  012700  002304                TBG4$:  MOV     #SUPDR6+2,R0
 4384 026320  014006                                MOV     -(R0),SP
 4385 026322  014005                                MOV     -(R0),R5
 4386 026324  014004                                MOV     -(R0),R4
 4387 026326  014003                                MOV     -(R0),R3
 4388 026330  014002                                MOV     -(R0),R2
 4389 026332  014001                                MOV     -(R0),R1
 4390 026334  014000                                MOV     -(R0),R0
 4391 026336                                        SUPERVISOR              ;ENTER SUPERVISOR MODE
 4392 026344  012706  000740                        MOV     #SUPSTK,SSP
 4393 026350  104424                                CACHOFF                 ;TURN CACHE OFF
 4394 026352  004777  154002                        CALL    @SUPDOADD
 4395 026356  104423                                CACHON                  ;TURN CACHE ON
 4396 026360  104417                                KERNEL                  ;ENTER KERNEL MODE
 4397 026362  000004                                SCOPE
 4398 026364                                        POP     $LPADR,$LPERR
 4399 026374  000207                                RETURN
```

```
                                        .SBTTL  MEMORY TEST PATTERN ROUTINES
                                ;*******************************************************************************
                                ; PATTERN REGISTER CONVENTIONS
                                ;       R0      FIRST ADDRESS OF PATTERN (FIRST,LAST+2,ETC)
                                ;       R1      NUMBER OF ADDRESSES IN PATTERN (SIZE)
                                ;       R2      DATA FOR PATTERN (ONES,52525,ETC)
                                ;       R3      COPY OF R1 (IF NECESSARY)
                                ;       R4      COPY OF R0 (IF NECESSARY)
                                ;       R5      COPY OF R2 (IF NECESSARY)
                                ;*******************************************************************************
026376                          MTP000: SUBTST  <<MTP000        BASIC DATA TEST>>
                                ;*******************************************************************************
                                ;*SUBTEST        MTP000  BASIC DATA TEST
                                ;*******************************************************************************
026376  010220                  1$:     MOV     R2,(R0)+        ;V177640
026400  077102                          SOB     R1,MTP000       ;V177642
026402  000240                          NOP                     ;V177644
026404  012401                  2$:     MOV     (R4)+,R1        ;V177646
026406  020102                          CMP     R1,R2           ;V177650
026410  001402                          BEQ     3$              ;V177652
026412  104430                          PERR02                  ;V177654
026414  000240                          NOP                     ;V177656
026416  077306                  3$:     SOB     R3,2$           ;V177660
026420  000207                          RETURN                  ;V177662
026422                          MTP001: SUBTST  <<MTP001        ADDRESS TEST>>
                                ;*******************************************************************************
                                ;*SUBTEST        MTP001  ADDRESS TEST
                                ;*******************************************************************************
026422  010220                  3$:     MOV     R2,(R0)+        ;V177640
026424  062702  000002                  ADD     #2,R2           ;V177642
026430  077104                          SOB     R1,3$           ;V177646
026432  000240                          NOP                     ;V177650
026434  012400                  1$:     MOV     (R4)+,R0        ;V177652
026436  020005                          CMP     R0,R5           ;V177654
026440  001401                          BEQ     2$              ;V177656
026442  104427                          PERR01                  ;V177660
026444  062705  000002          2$:     ADD     #2,R5           ;V177662
026450  077307                          SOB     R3,1$           ;V177666
026452  000207                          RETURN                  ;V177672
026454                          MTP002: SUBTST  <<MTP002        COMPLEMENT ADDRESS TEST (WRITE DOWN, READ UP)>>
                                ;*******************************************************************************
                                ;*SUBTEST        MTP002  COMPLEMENT ADDRESS TEST (WRITE DOWN, READ UP)
                                ;*******************************************************************************
026454  010540                  3$:     MOV     R5,-(R0)        ;V177640
026456  062705  000002                  ADD     #2,R5           ;V177642
026462  077104                          SOB     R1,3$           ;V177646
026464  000240                          NOP                     ;V177650
026466  162702  000002          1$:     SUB     #2,R2           ;V177652
026472  012401                          MOV     (R4)+,R1        ;V177656
026474  020102                          CMP     R1,R2           ;V177660
026476  001401                          BEQ     2$              ;V177662
026500  104430                          PERR02                  ;V177664
026502  077307                  2$:     SOB     R3,1$           ;V177666
026504  000207                          RETURN                  ;V177670
```

```
                                MTPA03: SUBTST  <<MTPA03        3 XOR 9 WORST CASE NOISE TEST (WRITE)>>
                                ;*********************************************************************
                                ;*SUBTEST        MTPA03  3 XOR 9 WORST CASE NOISE TEST (WRITE)
                                ;*********************************************************************
                                        ;R0 = INTERLEAVE FACTOR
                                        ;R1 = ADDRESS
                                        ;R2 = SMALL LOOP CONSTANT
                                        ;R3 = NUM OF ADD TO TEST (LARGE LOOP)
                                        ;R4 - GOOD DATA
                                        ;R5 = MEDIUM LOOP CONSTANT
                                        .ENABL  LSB
026506  060001                 1$.     ADD     R0,R1           ;V177636 ADD INTERLEAVE FACTOR
026510  010421                         MOV     R4,(R1)+        ;V177640
026512  010421                         MOV     R4,(R1)+        ;V177642
026514  077204                         SOB     R2,1$           ;V177644
026516  005104                         COM     R4              ;V177646
026520  052704                         BIS     (PC)+,R4        ;V177650
026522  000401                 WARN2:  401                     ;V177652 WARNING LOCATION IS MODIFIED BEFORE LOADING
026524  012702  000004                 MOV     #4,R2           ;V177654
026530  077512                         SOB     R5,1$           ;V177660
026532  005104                         COM     R4              ;V177662
026534  052704                         BIS     (PC)+,R4        ;V177664
026536  000401                 WARN3:  401                     ;V177666 WARNING LOCATION IS MODIFIED BEFORE LOADING
026540  012705  000100                 MOV     #64.,R5         ;V177670
026544  077320                         SOB     R3,1$           ;V177674
026546  000207                         RETURN                  ;V177676
                                        .DSABL  LSB

                                MTPB03: SUBTST  <<MTPB03        3 XOR 9 WORST CASE NOISE TEST (READ)>>
                                ;*********************************************************************
                                ;*SUBTEST        MTPB03  3 XOR 9 WORST CASE NOISE TEST (READ)
                                ;*********************************************************************
                                        .ENABL  LSB
026550  000137  172360          1$:     JMP     KDPAR0          ;V177640        GO TO V172360
026554  077203                         SOB     R2,1$           ;V177644
026556  005104                         COM     R4              ;V177646
026560  052704                         BIS     (PC)+,R4        ;V177650
026562  000401                 WARN4:  401                     ;V177652 WARNING LOCATION IS MODIFIED BEFORE LOADING
026564  012702  000004                 MOV     #4,R2           ;V177654
026570  077512                         SOB     R5,1$           ;V177660
026572  005104                         COM     R4              ;V177662
026574  052704                         BIS     (PC)+,R4        ;V177664
026576  000401                 WARN5:  401                     ;V177666 WARNING LOCATION IS MODIFIED BEFORE LOADING
026600  012705  000100                 MOV     #64.,R5         ;V177670
026604  077317                         SOB     R3,1$           ;V177674
026606  000207                         RETURN                  ;V177676
                                        .DSABL  LSB
```

```
 4494 026610                            MTPC03: SUBTST  <<MTPC03        TEST DATA SUBPROGRAM>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPC03  TEST DATA SUBPROGRAM
                                        ;*********************************************************************
 4495 026610  060001                            ADD     R0,R1           ;V172360
 4496 026612  020421                            CMP     R4,(R1)+        ;V172362
 4497 026614  001401                            BEQ     1$              ;V172364
 4498 026616  104431                            PERR03                  ;V172366
 4499 026620  005141                    1$:     COM     -(R1)           ;V172370
 4500 026622  005111                            COM     (R1)            ;V172372
 4501 026624  000137  172260                    JMP     SDPAR0          ;V174372        GO TO V172260
 4502
 4503 026630                            MTPD03: SUBTST  <<MTPD03        TEST DATA SUBSUBPROGRAM>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPD03  TEST DATA SUBSUBPROGRAM
                                        ;*********************************************************************
 4504 026630  020421                            CMP     R4,(R1)+        ;V172260
 4505 026632  001401                            BEQ     1$              ;V172262
 4506 026634  104431                            PERR03                  ;V172264
 4507 026636  005127                    1$:     COM     (PC)+           ;V172266
 4508 026640  000000                            0                       ;V172270
 4509 026642  001033                            BNE     .+70            ;V172272        GO TO V172362
 4510 026644  000137  177644                    JMP     UIPAR2          ;V172274        GO TO V177644
```

```
 4513 026650                            MTPA04: SUBTST  <<MTPA04         ROTATING ZEROS TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPA04  ROTATING ZEROS TEST
                                        ;*********************************************************************
 4514 026650  012705  000010            1$:     MOV     #8.,R5           ;V177640
 4515 026654  010504                            MOV     R5,R4            ;V177644
 4516 026656  000241                            CLC                      ;V177646
 4517 026660  000137  172360                    JMP     KDPAR0  ;V177650
 4518 026664  016004  177776                    MOV     -2(R0),R4        ;V177654
 4519 026670  103402                            BCS     2$               ;V177660
 4520 026672  020204                            CMP     R2,R4            ;V177662
 4521 026674  001401                            BEQ     3$               ;V177664
 4522 026676  104432                    2$:     PERR04                   ;V177666
 4523 026700  077115                    3$:     SOB     R1,1$            ;V177670
 4524 026702  000207                            RETURN                   ;V177672
 4525
 4526 026704                            MTPB04: SUBTST  <<MTPB04         SUBR    ROTATING BIT>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPB04  SUBR    ROTATING BIT
                                        ;*********************************************************************
 4527 026704  106110                    1$:     ROLB    (R0)             ;V172360
 4528 026706  077502                            SOB     R5,1$            ;V172362
 4529 026710  106120                            ROLB    (R0)+            ;V172364
 4530 026712  106110                    2$:     ROLB    (R0)             ;V172366
 4531 026714  077402                            SOB     R4,2$            ;V172370
 4532 026716  106120                            ROLB    (R0)+            ;V172372
 4533 026720  000137  177654                    JMP     UIPAR6           ;V172374
 4534
 4535 026724                            MTP005: SUBTST  <<MTP005         ROTATION ONES TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTP005  ROTATION ONES TEST
                                        ;*********************************************************************
 4536 026724  012705  000010            1$:     MOV     #8.,R5           ;V177640
 4537 026730  010504                            MOV     R5,R4            ;V177644
 4538 026732  000261                            SEC                      ;V177646
 4539 026734  000137  172360                    JMP     KDPAR0  ;V177650
 4540 026740  016004  177776                    MOV     -2(R0),R4        ;V177654
 4541 026744  103002                            BCC     2$               ;V177660 IF THIS HAPPENS THE GOOD & BAD MATCH
 4542 026746  020204                            CMP     R2,R4            ;V177662
 4543 026750  001401                            BEQ     3$               ;V177664
 4544 026752  104432                    2$:     PERR04                   ;V177666
 4545 026754  077115                    3$:     SOB     R1,1$            ;V177670
 4546 026756  000207                            RETURN                   ;V177672
```

```
 4550 026760                            MTP006: SUBTST  <<MTP006        INITIAL DATA TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP006  INITIAL DATA TEST
                                        ;*****************************************************************************
 4551                                                   ;       THIS TEST CHECKS THE DI/DO LINES BY
 4552                                                   ;       SHIFTING A 1 THROUGH THE WORD.
 4553 026760  012737  000001  002340          MOV     #1,DATBUF       ;SET THE FIRST TEST BIT
 4554 026766  005037  002342                  CLR     DATBUF+2        ;CLEAR 2ND WORD
 4555 026772  013711  002340          1$:     MOV     DATBUF,(R1)     ;WRITE TEST WORD 1
 4556 026776  013761  002342  000002          MOV     DATBUF+2,2(R1)  ;AND TEST WORD 2
 4557 027004  011102                          MOV     (R1),R2
 4558 027006  023702  002340                  CMP     DATBUF,R2       ;NOW READ THEM
 4559 027012  001401                          BEQ     2$              ;BR IF FIRST 16 OK
 4560 027014  104433                          PERR07                  ;ERROR TRAP
 4561
 4562 027016  016102  000002          2$:     MOV     2(R1),R2
 4563 027022  023702  002342                  CMP     DATBUF+2,R2     ;NOW READ SECOND WORD
 4564 027026  001401                          BEQ     3$              ;BR IF OK
 4565 027030  104434                          PERR10                  ;ERROR TRAP
 4566
 4567 027032  005737  002342          3$:     TST     DATBUF+2        ;HAS LAST BIT BEEN TESTED ?
 4568 027036  100405                          BMI     4$              ;MINUS MEANS BIT 31
 4569 027040                                  DLEFT   DATBUF          ;NO, SHIFT TEST BIT LEFT
 4570 027050  000750                          BR      1$              ;GO WRITE NEW TEST DATA
 4571                                                                 ;NOW GOING TO SHIFT A 0 IN DATA DIRECTION
 4572 027052  012737  177776  002340  4$:     MOV     #177776,DATBUF  ;PUT A 0 IN BIT 0
 4573 027060  012737  177777  002342          MOV     #-1, DATBUF+2   ;AND 1'S IN ALL OTHERS
 4574 027066  013711  002340          5$:     MOV     DATBUF,(R1)     ;WRITE THE DATA
 4575 027072  013761  002342  000002          MOV     DATBUF+2,2(R1)  ;2 WORDS WORTH
 4576 027100  011102                          MOV     (R1),R2
 4577 027102  023702  002340                  CMP     DATBUF,R2       ;NOW READ FIRST WORD
 4578 027106  001401                          BEQ     6$              ;BR IF OK
 4579 027110  104433                          PERR07
 4580
 4581 027112  016102  000002          6$:     MOV     2(R1),R2
 4582 027116  023702  002342                  CMP     DATBUF+2,R2     ;NOW, READ SECOND WORD
 4583 027122  001401                          BEQ     7$              ;BR IF OK
 4584 027124  104434                          PERR10
 4585
 4586 027126  005737  002342          7$:     TST     DATBUF+2        ;TESTED BIT 31 YET?
 4587 027132  100005                          BPL     8$              ;BR IF YES, WE'RE DONE
 4588 027134                                  DLEFT   DATBUF
 4589 027144  000750                          BR      5$              ;KEEP GOING
 4590 027146  000207          8$:     RETURN
```

```
4594 027150                    MTP007. SUBTST  <<MTP007        ADDRESS BIT TEST>>
                               ;*****************************************************************************
                               ;*SUBTEST       MTP007  ADDRESS BIT TEST
                               ;*****************************************************************************
4595                                           ;       THIS TEST CHECKS TO SEE THAT EACH ADDRESS
4596                                           ;       BIT IN EACH 16K BANK CAN BE ASSERTED UNIQUELY.
4597                                           ;       IT CHECKS FOR ADDRESS BITS THAT MAY BE STUCK
4598                                           ;       HIGH, STUCK LOW OR STUCK TOGETHER.
4599 027150  111100              MOVB    (R1),R0
4600 027152  105700              TSTB    R0              ;READ AND COMPARE FOR ZEROS
4601 027154  001401              BEQ     1$              ;BR IF OK
4602 027156  104435              PERR11
4603
4604 027160  105111      1$:     COMB    (R1)            ;COMPLEMENT THE BYTE
4605 027162  111100              MOVB    (R1),R0
4606 027164  105700              TSTB    R0              ;READ FOR NON ZEROS
4607 027166  001001              BNE     2$              ;BR IF OK
4608 027170  104436              PERR12
4609
4610 027172  040201      2$:     BIC     R2,R1           ;MASK OFF THE ASSERTED BIT
4611 027174  006302              ASL     R2              ;SHIFT R2 FOR NEXT BIT
4612 027176  050201              BIS     R2,R1           ;SET THE NEW BIT INTO R1
4613 027200  011100              MOV     (R1),R0
4614 027202  005700              TST     R0              ;READ THE NEW ADDRESS
4615 027204  001401              BEQ     3$              ;READ FOR ZEROS
4616 027206  104437              PERR13
4617
4618 027210  005111      3$:     COM     (R1)            ;COMPL THE WORD
4619 027212  011100              MOV     (R1),R0
4620 027214  005700              TST     R0              ;READ IT AGAIN
4621 027216  001001              BNE     4$
4622 027220  104440              PERR14
4623
4624 027222  022702  100000  4$: CMP     #100000,R2
4625 027226  001407              BEQ     5$
4626 027230  022702  010000      CMP     #10000,R2       ;CHECK FOR MSB IN 4K BANK
4627 027234  001356              BNE     2$              ;NOT LAST BIT, BRANCH
4628 027236  006302              ASL     R2
4629 027240  012701  160000      MOV     #160000,R1
4630 027244  000752              BR      2$
4631 027246  000207      5$:     RETURN
```

```
 4634 027250                            MTP010: SUBTST  <<MTP010        BYTE ADDRESSING TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP010  BYTE ADDRESSING TEST
                                        ;*****************************************************************************
 4635                                                   ;TEST 3 THIS TEST CHECKS FOR PROPER
 4636                                                   ;       BYTE ADDRESSING WITH ECC DISABLED
 4637 027250  010402                            MOV     R4,R2           ;R4 HAS LOWEST ADDRESS
 4638 027252  010403                            MOV     R4,R3           ;PUT IT IN R3 ALSO
 4639 027254  062702  000004                    ADD     #4,R2           ;POINT R2 TO LAST BYTE +1
 4640 027260  012713  177777                    MOV     #-1,(R3)        ;WRITE ALL ONES IN
 4641 027264  012763  177777  000002            MOV     #-1,2(R3)       ;THE 4 TEST BYTES
 4642 027272  105013                    1$:     CLRB    (R3)            ;CLEAR A BYTE
 4643 027274  010401                            MOV     R4,R1           ;INITIALIZE R1 FOR EACH PASS
 4644 027276  020201                    2$:     CMP     R2,R1           ;IF EQUAL, JUST READ LAST BYTE
 4645 027300  001420                            BEQ     6$              ;BR IF EQUAL
 4646 027302  020301                            CMP     R3,R1           ;IS THIS THE BYTE OF ZEROS
 4647 027304  001007                            BNE     4$              ;BR IF NOT
 4648 027306  111100                            MOVB    (R1),R0
 4649                                           ;WARNING IF YOU OPTOMIZE CHANGE THE PCBUMP FOR THIS ERROR INCASE OF TRAPS
 4650 027310  022700  000000                    CMP     #0,R0           ;IT IS, COMPARE FOR ZEROS
 4651 027314  001401                            BEQ     3$
 4652 027316  104435                            PERR11
 4653
 4654 027320  005201                    3$:     INC     R1              ;NEXT BYTE
 4655 027322  000765                            BR      2$              ;RETURN
 4656 027324  111100                    4$:     MOVB    (R1),R0
 4657 027326  122700  177777                    CMPB    #-1,R0          ;ITS NOT THE BYTE OF 0'S, READ 1'S
 4658 027332  001401                            BEQ     5$
 4659 027334  104436                            PERR12
 4660
 4661 027336  005201                    5$:     INC     R1              ;MOVE TO NEXT BYTE
 4662 027340  000756                            BR      2$
 4663 027342  112713  177777            6$:     MOVB    #-1,(R3)        ;RESTORE 1'S TO BYTE JUST TESTED
 4664 027346  005203                            INC     R3              ;INC TO NEXT BYTE
 4665 027350  020302                            CMP     R3,R2           ;WAS THAT JUST THE LAST ONE?
 4666 027352  001347                            BNE     1$              ;BR IF NO
 4667 027354  000207                            RETURN
```

```
 4671 027356                            MTP011: SUBTST  <<MPT011        SINGLE BIT ERROR TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MPT011  SINGLE BIT ERROR TEST
                                        ;*****************************************************************************
 4672                                           ;(1)    CREATE A SINGLE BIT ERROR
 4673                                           ;
 4674                                           ;(2)    READ BACK SBE UNCORRECTED (WITH ECC DISABLE)
 4675                                           ;
 4676                                           ;(3)    ENABLE ECC & READ CORRECTED DATA
 4677                                           ;
 4678                                           ;(4)    CHECK THAT THE SBE FLAG WAS SET FORM THE LAST READ
 4679                                           ;
 4680                                           ;(5)    DO (1-4) FOR DATA CONSISTING OF 1 BIT SET IN EACH OF 32
 4681                                           ;       POSITIONS OF A DOUBLE WORD
 4682                                           ;       THEN DO IT AGAIN FOR 1 BIT CLEARED IN EACH OF 32 POSITIONS OF
 4683                                           ;       A DOUBLE WORD
 4684                                           ;       IE (64 TIMES)
 4685                                           ;
 4686                                           ;(6)    DO (1-5) FOR A SBE IN EACH OF 32 BIT POSITIONS
 4687                                           ;       IE (RUN TEST 64 * 32 = 2048 TIMES)
 4688 027356  104503                           CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4689                                   ;BIG LOOP
 4690 027360  012737  000001  002340  1$:      MOV     #1,DATBUF       ;INITIAL DATA
 4691 027366  005037  002342                   CLR     DATBUF+2        ;32 BITS WORTH
 4692                                   ;MEDIUM LOOP
 4693 027372  012737  000001  002350  2$:      MOV     #1,SBEMSK       ;INITIAL ERROR MASK
 4694 027400  005037  002352                   CLR     SBEMSK+2        ;32 BITS WORTH
 4695                                   ;LITTLE LOOP
 4696 027404  013737  002340  002344  3$:      MOV     DATBUF,TSTDAT   ;
 4697 027412  013737  002342  002346           MOV     DATBUF+2,TSTDAT+2;TO SAVE ORIG DATA
 4698 027420  105737  002362                   TSTB    PASFLG  ;COMP DATA ON SECOND PASSONLY
 4699 027424  001404                           BEQ     4$              ;BR IF FIRST PASS
 4700 027426  005137  002344                   COM     TSTDAT          ;SECOND PASS, COMP BOTH WORDS
 4701 027432  005137  002346                   COM     TSTDAT+2
 4702 027436  013702  002344           4$:     MOV     TSTDAT,R2
 4703 027442  013703  002346                   MOV     TSTDAT+2,R3
 4704 027446  012737  002344  002402           MOV     #TSTDAT,SOURCE  ;SET UP ADDRESS FOR CHKGEN
 4705 027454  004737  040540                   CALL    CHKGEN          ;GEN CHECKBITS ON TSTDAT
 4706                                   ;*******************************
 4707                                   ;** CREATE A SINGLE BIT ERROR **
 4708                                   ;*******************************
 4709 027460  013701  002350                   MOV     SBEMSK,R1
 4710 027464  074137  002344                   XOR     R1,TSTDAT
 4711 027470  013701  002352                   MOV     SBEMSK+2,R1
 4712 027474  074137  002346                   XOR     R1,TSTDAT+2
 4713 027500  013701  002506           5$:     MOV     TESTADD,R1      ;FIRST TEST ADDRESS
 4714 027504  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4715 027506  013721  002344                   MOV     TSTDAT,(R1)+    ;WRITE FIRST 16 BITS
 4716 027512  104475                           CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 4717 027514  013711  002346                   MOV     TSTDAT+2,(R1)   ;WRITE SECOND 16 BITS AND
 4718                                                                   ;CHECK BITS. WE NOW HAVE CHECKBITS
 4719                                                                   ;GENERATED ON DATBUF AND DATA WITH
 4720                                                                   ;ONE BIT IN ERROR (AS PER SBEMSK).
 4721 027520  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4722 027522  014100                           MOV     -(R1),R0
 4723 027524  020037  002344                   CMP     R0,TSTDAT       ;READ THE LOW WORD (UNCORRECTED)
 4724 027530  001401                           BEQ     6$              ;BR IF OK
```

```
 4725 027532  104455                          PERR31
 4726
 4727 027534  062701  000002          6$:     ADD     #2,R1           ;POINT R1 TO SECOND 16 BITS
 4728 027540  011100                          MOV     (R1),R0
 4729 027542  020037  002346                  CMP     R0,TSTDAT+2     ;READ THE HIGH WORD (UNCORRECTED)
 4730 027546  001401                          BEQ     7$              ;BR IF OK
 4731 027550  104455                          PERR31
 4732
 4733 027552  104503                  7$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4734 027554  014100                          MOV     -(R1),R0
 4735 027556  020002                          CMP     R0,R2           ;SEE IF ITS BEEN CORRECTED
 4736 027560  001401                          BEQ     8$              ;IT SHOULD HAVE BEEN
 4737 027562  104456                          PERR32
 4738
 4739 027564  104510                  8$:     TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 4740 027566  103411                          BCS     9$              ;BR IF IT IS SET
 4741 027570                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
 4742 027576  010137  002040                  MOV     R1,ADDRESS
 4743 027602  104460                          PERR34
 4744 027604                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
 4745
 4746 027612  104503                  9$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4747 027614  062701  000002                  ADD     #2,R1           ;POINT TO HIGH WORD
 4748 027620  011100                          MOV     (R1),R0
 4749 027622  020003                          CMP     R0,R3           ;SEE IF ITS BEEN CORRECTED
 4750 027624  001401                          BEQ     10$             ;BR IF OK
 4751 027626  104456                          PERR32
 4752
 4753 027630  104510                  10$:    TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 4754 027632  103411                          BCS     11$             ;BR IF YES
 4755 027634                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
 4756 027642  010137  002040                  MOV     R1,ADDRESS
 4757 027646  104460                          PERR34
 4758 027650                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
 4759 027656  005737  002352          11$:    TST     SBEMSK+2        ;TEST FOR LAST MASK BIT
 4760 027662  100405                          BMI     12$             ;MINUS MEANS BIT 31
 4761 027664                                  DLEFT   SBEMSK
 4762 027674  000643                          BR      3$
 4763 027676                          12$:    IF #SW11 SET.IN @SWR THEN GOTO 13$
 4764 027706                                  IF QVFLAG IS TRUE THEN GOTO 13$
 4765 027714  005737  002342                  TST     DATBUF+2        ;LAST DATA BIT ?
 4766 027720  100405                          BMI     13$             ;WHICH IS BIT 31
 4767 027722                                  DLEFT   DATBUF
 4768 027732  000617                          BR      2$
 4769 027734  105737  002362          13$:    TSTB    PASFLG  ;FIRST OR SECOND PASS ?
 4770 027740  001003                          BNE     14$             ;NON ZERO MEANS WE'RE DONE
 4771 027742  105237  002362                  INCB    PASFLG  ;NOT DONE, GO DO SECOND PASS
 4772 027746  000604                          BR      1$
 4773                                         ;CLEAR OUT ANY DBE'S OR SBE'S
 4774 027750  104471                  14$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4775 027752  013701  002506                  MOV     TESTADD,R1
 4776 027756                                  CLEAR   (R1)+,(R1)
 4777 027762  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4778 027764  000207                          RETURN
```

```
4782 027766                          MTP012: SUBTST  <<MTP012        WRITE BYTE CLEARS SBE TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MTP012  WRITE BYTE CLEARS SBE TEST                          \
                                     ;*****************************************************************************
4783                                                 ;SINGLE BIT ERROR TEST TO INSURE THAT A WRITE
4784                                                 ;BYTE CLEARS SINGLE BIT ERRORS.
4785 027766  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
4786 027770  012737  000001  002340        MOV     #1,DATBUF       ;INITIAL DATA
4787 027776  005037  002342                CLR     DATBUF+2        ;32 BITS WORTH
4788 030002  012737  000001  002350  1$:   MOV     #1,SBEMSK       ;INITIAL ERROR MASK
4789 030010  005037  002352                CLR     SBEMSK+2        ;32 BITS WORTH
4790 030014  013737  002340  002344  2$:   MOV     DATBUF,TSTDAT   ;SAVE ORIGINAL DATA
4791 030022  013737  002342  002346        MOV     DATBUF+2,TSTDAT+2;BOTH WORDS
4792 030030  012737  002344  002402        MOV     #TSTDAT,SOURCE  ;NEED ADDRESS FOR CHKGEN
4793 030036  004737  040540                CALL    CHKGEN          ;GENERATE CHECK BITS
4794 030042  013701  002350                MOV     SBEMSK,R1
4795 030046  074137  002344                XOR     R1,TSTDAT
4796 030052  013701  002352                MOV     SBEMSK+2,R1
4797 030056  074137  002346                XOR     R1,TSTDAT+2
4798 030062  013704  002506        3$:     MOV     TESTADD,R4      ;FIRST TEST ADDRESS
4799 030066  010401                        MOV     R4,R1           ;PUT IT IN R1 ALSO
4800 030070  104471                        ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
4801 030072  013721  002344                MOV     TSTDAT,(R1)+    ;WRITE 16 BITS
4802 030076  104475                        CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
4803 030100  013711  002346                MOV     TSTDAT+2,(R1)   ;WRITE HIGH WORD+CHECKBITS
4804 030104  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
4805                                                 ;IT'S DANGEROUS IF WE DON'T
4806 030106  012702  002350                MOV     #SBEMSK,R2      ;ADDRESS OF ERROR MASK
4807 030112  162701  000002                SUB     #2,R1           ;ADJUST ADDRESS
4808 030116  112711  177777        4$:     MOVB    #-1,(R1)        ;WRITE A BYTE OF 1'S
4809 030122  132712  177777                BITB    #-1,(R2)        ;DID THIS BYTE HAVE THE BAD BIT IN IT?
4810 030126  001420                        BEQ     6$              ;NO - BRANCH
4811 030130  104510                        TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
4812 030132  103011                        BCC     5$              ;NO - SKIP
4813 030134                                SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
4814 030142  010137  002040                MOV     R1,ADDRESS
4815 030146  104017                        ERROR   +17
4816 030150                                SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
4817
4818 030156  111100                4$:     MOVB    (R1),R0
4819 030160  122700  177777                CMPB    #-1,R0          ;CHECK DATA
4820 030164  001414                        BEQ     7$              ;BR IF OK
4821 030166  104457                        PERR33
4822
4823 030170  104510                6$:     TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
4824                                                 ;READ THE BYTE
4825                                                 ;SBE ERROR BIT ONLY SET ?
4826 030172  103771                        BCS     5$              ;SHOULD BE SET, BR IF OK
4827 030174                                SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
4828 030202  010137  002040                MOV     R1,ADDRESS
4829 030206  104460                        PERR34
4830 030210                                SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
4831
4832 030216  132712  177777        7$:     BITB    #-1,(R2)        ;CHECK FOR LAST BYTE
4833 030222  001012                        BNE     8$              ;
4834 030224  005202                        INC     R2
4835 030226  005201                        INC     R1              ;MOVE   TO      NEXT BYTE
```

```
 4836 030230  013704  002506                MOV     TESTADD,R4      ;FIRST TEST ADDRESS
 4837 030234  032701  000002                BIT     #2,R1           ;TEST FOR LOWER WORD
 4838 030240  001726                        BEQ     4$              ;BR IF IT'S LOW 16 BIT'S
 4839 030242  062704  000002                ADD     #2,R4           ;ADJUST POINTER FOR ERROR REPT.
 4840 030246  000723                        BR      4$
 4841 030250  005737  002352        8$:     TST     SBEMSK+2        ;LAST ERROR BIT ?
 4842 030254  100405                        BMI     9$              ;MINUS MEANS BIT 31
 4843 030256                                DLEFT   SBEMSK
 4844 030266  000652                        BR      2$
 4845 030270                        9$:     IF #SW11 SET.IN @SWR THEN GOTO 10$
 4846 030300                                IF QVFLAG IS TRUE THEN GOTO 10$
 4847 030306  005737  002342                TST     DATBUF+2        ;LAST DATA BIT?
 4848 030312  100405                        BMI     10$             ;MINUS = BIT 31
 4849 030314                                DLEFT   DATBUF
 4850 030324  000626                        BR      1$
 4851                                       ;CLEAR OUT ANY DBE'S OR SBE'S
 4852 030326  104471                10$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4853 030330  013701  002506                MOV     TESTADD,R1
 4854 030334                                CLEAR   (R1)+,(R1)
 4855 030340  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4856 030342  000207                        RETURN
```

```
                                MTP013: SUBTST  <<MTP013        CREATE DOUBLE BIT ERROR TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTP013  CREATE DOUBLE BIT ERROR TEST
                                ;*****************************************************************************
                                        ;DOUBLE BIT ERROR FORCE TO CHECK DOUBLE ERROR LOGIC
030344  104503                  CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
030346  013701  002506          MOV     TESTADD,R1
030352  005037  002340  1$:     CLR     DATBUF          ;MAKE INITIAL DATA
030356  005037  002342          CLR     DATBUF+2        ;ALL ZEROS
030362  012737  000001  002350  2$:     MOV     #1,SBEMSK       ;INITIAL SINGLE ERROR MASK
030370  005037  002352          CLR     SBEMSK+2        ;SECOND WORD
030374  012737  000001  002354  3$:     MOV     #1,DBEMSK       ;INITIAL DOUBLE ERROR MASK
030402  005037  002356          CLR     DBEMSK+2        ;32 BITS HERE ALSO
030406  013737  002340  002344  4$:     MOV     DATBUF,TSTDAT   ;
030414  013737  002342  002346          MOV     DATBUF+2,TSTDAT+2
030422  105737  002362          TSTB    PASFLG  ;NO COMPLEMENTING FIRST PASS
030426  001404                  BEQ     5$
030430  005137  002344          COM     TSTDAT          ;COMP FIRST WORD
030434  005137  002346          COM     TSTDAT+2        ;SECOND WORD
030440  104503                  5$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
030442  023737  002350  002354  CMP     SBEMSK,DBEMSK   ;CAN'T HAVE THE SAME ERROR BIT SET
030450  001004                  BNE     6$              ;IN BOTH MASKS
030452  023737  002352  002356  CMP     SBEMSK+2,DBEMSK+2;COULD BE EQUAL IN SECOND WORD
030460  001452                  BEQ     9$              ;GO MAKE THEM NOT EQUAL
030462  012737  002344  002402  6$:     MOV     #TSTDAT,SOURCE  ;SOURCE ADDRESS FOR CHKGEN
030470  004737  040540          CALL    CHKGEN          ;GO GENERATE CHECK BITS
030474  013702  002350          MOV     SBEMSK,R2
030500  074237  002344          XOR     R2,TSTDAT
030504  013702  002352          MOV     SBEMSK+2,R2
030510  074237  002346          XOR     R2,TSTDAT+2
030514  013702  002354          MOV     DBEMSK,R2
030520  074237  002344          XOR     R2,TSTDAT
030524  013702  002356          MOV     DBEMSK+2,R2
030530  074237  002346          XOR     R2,TSTDAT+2
030534  104471                  ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
030536  013721  002344          MOV     TSTDAT,(R1)+    ;WRITE 16 BITS
030542  104475                  CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
030544  013711  002346          MOV     TSTDAT+2,(R1)   ;WRITE HIGH WORD
030550  104503                  CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
030552  162701  000002          SUB     #2,R1           ;ADJUST TEST ADDRESS
030556  005711                  TST     (R1)            ;READ THE LOCATION
030560  104501                  WAS1DBE                 ;WAS THERE ANY DOUBLE BIT ERRORS ON 1 SELECTED CSR
030562  103411                  BCS     9$              ;IT SHOULD BE SET
030564                          SET     HEADER
030572  010137  002040          MOV     R1,ADDRESS
030576  104030                  ERROR   +30
030600                          SET     HEADER
```

```
4906 030606  005737  002356          9$:     TST     DBEMSK+2        ;CHECK MASK FOR LAST BIT
4907 030612  100405                          BMI     10$             ;MINUS = BIT31
4908 030614                                  DLEFT   DBEMSK
4909 030624  000670                          BR      4$
4910 030626                          10$:    IF #SW11 SET.IN @SWR THEN GOTO 11$
4911 030636                                  IF QVFLAG IS TRUE THEN GOTO 11$
4912 030644  005737  002352                  TST     SBEMSK+2        ;CHECK SINGLE ERROR MASK TOO
4913 030650  100405                          BMI     11$             ;BR IF DONE
4914 030652                                  DLEFT   SBEMSK
4915 030662  000644                          BR      3$
4916 030664  105737  002362          11$:    TSTB    PASFLG  ;FIRST PASS
4917 030670  001003                          BNE     12$             ;NON ZERO MEANS WE'RE DONE
4918 030672  105237  002362                  INCB    PASFLG  ;FIRST PASS, NOT DONE
4919                                         ;CLEAR OUT ANY DBE'S OR SBE'S
4920 030676  000625                          BR      1$              ;KEEP GOING
4921 030700  104471                  12$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
4922 030702  013701  002506                  MOV     TESTADD,R1
4923 030706                                  CLEAR   (R1)+,(R1)
4924 030712  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
4925 030714  000207                          RETURN
```

```
 4929 030716                            MTP014: SUBTST  <<MTP014        WRITE INHIBIT DURING DATIP WITH DBE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP014  WRITE INHIBIT DURING DATIP WITH DBE TEST
                                        ;*****************************************************************************
 4930                                                   ;THIS TEST CHECKS THE WRITE INHIBIT ON DOUBLE
 4931                                                   ;BIT ERRORS DURING A DATIP OPERATION BY USE
 4932                                                   ;OF AN 'ASRB' INSTRUCTION.
 4933                                                   ;
 4934                                                   ;NOTE:  THIS IS ONLY A USEFULL TEST ON PDP11/70 WITH THE MULTIPORT ECO
 4935                                                   ;IE THOSE THAT DO A DATIP ON THE ASRB (LOCK) INSTRUCTION.
 4936 030716  005037  002340            1$:     CLR     DATBUF          ;INITIAL DATA
 4937 030722  005037  002342                    CLR     DATBUF+2        ;2 WORDS WORTH
 4938 030726  012737  000001  002350    2$.     MOV     #1,SBEMSK       ;INITIAL ERROR MASK
 4939 030734  005037  002352                    CLR     SBEMSK+2        ;
 4940 030740  012737  000001  002354    3$:     MOV     #1,DBEMSK       ;DOUBLE ERROR MASK
 4941 030746  005037  002356                    CLR     DBEMSK+2        ;2 WORDS
 4942 030752  013737  002340  002344    4$:     MOV     DATBUF,TSTDAT   ;PRESERVE ORIG DATA
 4943 030760  013737  002342  002346            MOV     DATBUF+2,TSTDAT+2
 4944 030766  105737  002362                    TSTB    PASFLG  ;SECOND PASS YET ?
 4945 030772  001404                            BEQ     5$              ;BR IF NO
 4946 030774  005137  002344                    COM     TSTDAT          ;COMPL DATA  ON SECOND PASS
 4947 031000  005137  002346                    COM     TSTDAT+2
 4948 031004  104503                    5$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4949 031006  023737  002354  002350            CMP     DBEMSK,SBEMSK   ;CHECK FOR SAME MASKS
 4950 031014  001004                            BNE     6$              ;BR IF OK
 4951 031016  023737  002356  002352            CMP     DBEMSK+2,SBEMSK+2
 4952 031024  001466                            BEQ     11$             ;BR IF THEY'RE EQUAL
 4953 031026  012737  002344  002402    6$:     MOV     #TSTDAT,SOURCE  ;SET UP ADDRESS FOR CHKGEN
 4954 031034  004737  040540                    CALL    CHKGEN          ;GENERATE CHECK BITS
 4955 031040  013701  002350                    MOV     SBEMSK,R1
 4956 031044  074137  002344                    XOR     R1,TSTDAT
 4957 031050  013701  002352                    MOV     SBEMSK+2,R1
 4958 031054  074137  002346                    XOR     R1,TSTDAT+2
 4959 031060  013701  002354                    MOV     DBEMSK,R1
 4960 031064  074137  002344                    XOR     R1,TSTDAT
 4961 031070  013701  002356                    MOV     DBEMSK+2,R1
 4962 031074  074137  002346                    XOR     R1,TSTDAT+2
 4963 031100  013701  002506            7$:     MOV     TESTADD,R1      ;TEST ADDRESS
 4964 031104  104471                            ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4965 031106  013721  002344                    MOV     TSTDAT,(R1)+    ;WRITE FIRST 16 BITS
 4966 031112  104475                            CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 4967 031114  013711  002346                    MOV     TSTDAT+2,(R1)   ;SECOND 16 BITS+CHECKBITS
 4968 031120  105037  002363                    CLRB    UPPFLG          ;INDICATE LOWER WORD
 4969 031124  013703  002506                    MOV     TESTADD,R3      ;TEST ADDRESS
 4970 031130  104503                    8$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4971 031132  106223                            ASRB    (R3)+           ;SPECIAL DATIP INSTRUCTION
 4972 031134  014100                            MOV     -(R1),R0
 4973 031136  023700  002344                    CMP     TSTDAT,R0       ;CHECK FOR UNCHANGED DATA
 4974 031142  001401                            BEQ     9$              ;SHOULD BE UNCHANGED
 4975 031144  104455                            PERR31
 4976
 4977 031146  062701  000002            9$:     ADD     #2,R1           ;POINT TO UPPER WORD
 4978 031152  011100                            MOV     (R1),R0
 4979 031154  023700  002346                    CMP     TSTDAT+2,R0     ;READ IT
 4980 031160  001401                            BEQ     10$             ;BR IF UNCHANGED
 4981 031162  104455                            PERR31
 4982
```

```
 4983 031164  122737  000003  002363  10$:    CMPB    #3,UPPFLG               ;LOWER WORD
 4984 031172  001403                          BEQ     11$                     ,BR IF NO
 4985 031174  105237  002363                  INCB    UPPFLG
 4986 031200  000753                          BR      8$
 4987 031202  005737  002356          11$:    TST     DBEMSK+2                ;LAST BIT IN MASK ?
 4988 031206  100405                          BMI     12$                     ;BR IF BIT 31
 4989 031210                                   DLEFT   DBEMSK
 4990 031220  000654                          BR      4$
 4991 031222                          12$:    IF #SW11 SET.IN @SWR THEN GOTO 13$
 4992 031232                                  IF QVFLAG IS TRUE THEN GOTO 13$
 4993 031240  005737  002352                  TST     SBEMSK+2                ;LAST BIT IN SINGLE ERROR MASK
 4994 031244  100405                          BMI     13$                     ;BR IF YES
 4995 031246                                   DLEFT   SBEMSK
 4996 031256  000630                          BR      3$
 4997 031260  105737  002362          13$:    TSTB    PASFLG  ;WHICH PASS
 4998 031264  001003                          BNE     14$                     ;BR IF WE'RE DONE
 4999 031266  105237  002362                  INCB    PASFLG  ;INDICATE SECOND PASS COMING
 5000                                         ;CLEAR OUT ANY DBE'S OR SBE'S
 5001 031272  000611                          BR      1$                      ;GO DO IT!
 5002 031274  104471                  14$:    ECC1DIS                         ;DISABLE ECC ON 1 SELECTED CSR
 5003 031276  013701  002506                  MOV     TESTADD,R1
 5004 031302                                   CLEAR   (R1)+,(R1)
 5005 031306  104503                          CLR1CSR                         ;CLEAR 1 SELECTED MK11 CSR
 5006 031310  000207                          RETURN
```

```
SC  031312                          MTP015: SUBTST  <<MTP015        WRITE INHIBIT OF BYTE WITH DBE>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       MTP015  WRITE INHIBIT OF BYTE WITH DBE
                                    ;*****************************************************************************
 5011                                           ;CHECK FOR WRITE INHIBIT DURING A WRITE BYTE.
 5012                                           ;CHECKS FOR UNCORRECTED DATA.
 5013 031312  005037  002340       1$:     CLR     DATBUF          ;INITIAL DATA
 5014 031316  005037  002342               CLR     DATBUF+2        ;32 BITS WORTH
 5015 031322  012737  000001  002350 2$:    MOV     #1,SBEMSK       ;SINGLE ERROR MASK
 5016 031330  005037  002352               CLR     SBEMSK+2        ;
 5017 031334  012737  000001  002354 3$:    MOV     #1,DBEMSK       ;DOUBLE ERROR MASK
 5018 031342  005037  002356               CLR     DBEMSK+2        ;
 5019 031346  013737  002340  002344 4$:    MOV     DATBUF,TSTDAT   ;PRESERVE ORIG DATA
 5020 031354  013737  002342  002346       MOV     DATBUF+2,TSTDAT+2
 5021 031362  105737  002362               TSTB    PASFLG  ;WHICH PASS ?
 5022 031366  001404                       BEQ     5$              ;FIRST PASS, NO COMPLEMENTING
 5023 031370  005137  002344               COM     TSTDAT
 5024 031374  005137  002346               COM     TSTDAT+2        ;SECOND PASS, COMPLEMENT TSTDAT
 5025 031400  104503               5$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 5026 031402  023737  002350  002354       CMP     SBEMSK,DBEMSK   ;CHECK FOR SAME MASKS
 5027 031410  001004                       BNE     6$              ;BR IF NOT EQUAL
 5028 031412  023737  002352  002356       CMP     SBEMSK+2,DBEMSK+2       ;SECOND WORD ALSO
 5029 031420  001463                       BEQ     11$             ;BR TO MAKE THEM NOT EQUAL
 5030 031422  012737  002344  002402 6$:    MOV     #TSTDAT,SOURCE  ;ADDRESS FOR CHKGEN
 5031 031430  004737  040540               CALL    CHKGEN          ;GO GENERATE CHECK BITS
 5032 031434  013701  002350               MOV     SBEMSK,R1
 5033 031440  074137  002344               XOR     R1,TSTDAT
 5034 031444  013701  002352               MOV     SBEMSK+2,R1
 5035 031450  074137  002346               XOR     R1,TSTDAT+2
 5036 031454  013701  002354               MOV     DBEMSK,R1
 5037 031460  074137  002344               XOR     R1,TSTDAT
 5038 031464  013701  002356               MOV     DBEMSK+2,R1
 5039 031470  074137  002346               XOR     R1,TSTDAT+2
 5040 031474  013701  002506       7$:     MOV     TESTADD,R1      ;TEST LOCATION
 5041 031500  104471                       ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5042 031502  013721  002344               MOV     TSTDAT,(R1)+    ;WRITE FIRST 16 BITS
 5043                                       ;LOAD CSR WITH IMAGE FROM R2
 5044 031506  104475                       CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 5045 031510  013711  002346               MOV     TSTDAT+2,(R1)   ;WRITE SECOND 16 BITS + CHECKBITS
 5046 031514  104503                       CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 5047 031516  013702  002506               MOV     TESTADD,R2      ;GET ADDRESS OF TEST LOC
 5048 031522  010203                       MOV     R2,R3           ;R2 DESIGNATES FIRST BYTE
 5049 031524  062703  000003               ADD     #3,R3           ;R3 DESIGNATES LAST BYTE
 5050 031530  112722  000360       8$:     MOVB    #360,(R2)+      ;TRY WRITING A BYTE
 5051 031534  013701  002506               MOV     TESTADD,R1
 5052 031540  012100                       MOV     (R1)+,R0
 5053 031542  023700  002344               CMP     TSTDAT,R0       ;CHECK FOR UNCHANGED DATA
 5054 031546  001401                       BEQ     9$              ;BR IF OK
 5055 031550  104455                       PERR31
 5056
 5057 031552  011100               9$:     MOV     (R1),R0
 5058 031554  023700  002346               CMP     TSTDAT+2,R0     ;READ SECOND WORD
 5059 031560  001401                       BEQ     10$             ;BR IF UNCHANGED
 5060 031562  104455                       PERR31
 5061
 5062 031564  020203               10$:    CMP     R2,R3           ;TESTED LAST BYTE ?
 5063 031566  001360                       BNE     8$              ;BR IF NO
```

```
 5064 031570  005737  002356          11$:    TST     DBEMSK+2          ;CHECKING FOR LAST ERROR BIT
 5065 031574  100405                          BMI     12$               ;BR IF DONE HERE
 5066 031576                                   DLEFT   DBEMSK
 5067 031606  000657                          BR      4$
 5068 031610                           12$:    IF #SW11 SET.IN @SWR THEN GOTO 13$
 5069 031620                                   IF QVFLAG IS TRUE THEN GOTO 13$
 5070 031626  005737  002352                    TST     SBEMSK+2          ;LAST SBE MASK
 5071 031632  100405                          BMI     13$               ;BR IF DONE WITH THIS PASS
 5072 031634                                   DLEFT   SBEMSK
 5073 031644  000633                          BR      3$
 5074 031646  105737  002362          13$:    TSTB    PASFLG  ;TEST PASS FLAG
 5075 031652  001003                          BNE     14$               ;NON ZERO MEANS WE'RE DONE
 5076 031654  105237  002362                    INCB    PASFLG  ;NOT DONE
 5077 031660  000614                          BR      1$
 5078 031662  104471                   14$:    ECC1DIS                   ;DISABLE ECC ON 1 SELECTED CSR
 5079 031664  013701  002506                    MOV     TESTADD,R1        ;TEST LOCATION
 5080 031670                                   CLEAR   (R1)+,(R1)        ;TO ERASE ANY DBE'S FROM TESTING
 5081                                          ;RESTORE CSR
 5082 031674  104503                          CLR1CSR                   ;CLEAR 1 SELECTED MK11 CSR
 5083 031676  000207                          RETURN
```

```
 5087 031700                            MTP016: SUBTST  <<MTP016        WRITE INHIBIT OF WORD WITH DBE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP016  WRITE INHIBIT OF WORD WITH DBE
                                        ;*****************************************************************************
 5088                                           ;DOUBLE BIT ERROR WRITE CANCEL WITH
 5089                                           ;WORD WRITE.
 5090                                           ;CHECKS WRITE INHIBIT WITH WORD WRITES TO
 5091                                           ;WORD WITH DOUBLE ERROR.
 5092 031700  005037  002340          T12A:    CLR     DATBUF          ;BACKGROUND FOR DOUBLE ERRORS
 5093 031704  005037  002342                   CLR     DATBUF+2        ;2 WORDS WORTH
 5094 031710  012737  000001  002350           MOV     #1,SBEMSK       ;SINGLE ERROR MASK
 5095 031716  005037  002352                   CLR     SBEMSK+2        ;
 5096 031722  012737  000001  002354  T12B.    MOV     #1,DBEMSK       ;DOUBLE ERROR MASK
 5097 031730  005037  002356                   CLR     DBEMSK+2
 5098 031734  013737  002340  002344  1$:      MOV     DATBUF,TSTDAT   ;DATA FOR TEST
 5099 031742  013737  002342  002346          MOV     DATBUF+2,TSTDAT+2;BOTH WORDS
 5100 031750  105737  002362                   TSTB    PASFLG  ;COMP DATA ON SECOND PASS ONLY
 5101 031754  001404                           BEQ     2$              ;BR IF FIRST PASS
 5102 031756  005137  002344                   COM     TSTDAT          ;COMP FIRST WORD
 5103 031762  005137  002346                   COM     TSTDAT+2        ;NOW SECOND WORD
 5104 031766  023737  002350  002354  2$:      CMP     SBEMSK,DBEMSK   ;CHECK FOR IDENTICAL MASKS
 5105 031774  001004                           BNE     3$              ;BR IF DIFFERENT
 5106 031776  023737  002352  002356          CMP     SBEMSK+2,DBEMSK+2;UPPER WORD TOO
 5107 032004  001470                           BEQ     8$              ;BR TO MAKE THEM NOT EQUAL
 5108 032006  012737  002344  002402  3$:      MOV     #TSTDAT,SOURCE  ;NEED ADDR OF DATA FOR CHKGEN
 5109 032014  004737  040540                   CALL    CHKGEN          ;GO GENERATE CHECK BITS
 5110 032020  013701  002350                   MOV     SBEMSK,R1
 5111 032024  074137  002344                   XOR     R1,TSTDAT
 5112 032030  013701  002352                   MOV     SBEMSK+2,R1
 5113 032034  074137  002346                   XOR     R1,TSTDAT+2
 5114 032040  013701  002354                   MOV     DBEMSK,R1
 5115 032044  074137  002344                   XOR     R1,TSTDAT
 5116 032050  013701  002356                   MOV     DBEMSK+2,R1
 5117 032054  074137  002346                   XOR     R1,TSTDAT+2
 5118 032060  013701  002506          4$:      MOV     TESTADD,R1      ;FIRST TEST ADRRESS
 5119 032064  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5120 032066  013721  002344                   MOV     TSTDAT,(R1)+    ;WRITE FIRST 16 BITS
 5121 032072  104475                           CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 5122 032074  013711  002346                   MOV     TSTDAT+2,(R1)   ;WRITE SECOND 16 BITS + CHECKBITS
 5123 032100  105037  002363                   CLRB    UPPFLG          ;SET FOR 2 LOOPS
 5124 032104  162701  000002                   SUB     #2,R1           ;POINT TO LOW WORD
 5125 032110  104503          5$:      CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 5126 032112  012711  177400                   MOV     #177400,(R1)    ;TRY WRITING LOCATION
 5127 032116  013701  002506                   MOV     TESTADD,R1
 5128 032122  011100                           MOV     (R1),R0
 5129 032124  023700  002344                   CMP     TSTDAT,R0       ;CHECK FOR ORIGINAL DATA
 5130 032130  001401                           BEQ     6$              ;SHOULD BE UNCHANGED
 5131 032132  104455                           PERR31
 5132
 5133 032134  062701  000002          6$:      ADD     #2,R1
 5134 032140  011100                           MOV     (R1),R0
 5135 032142  023700  002346                   CMP     TSTDAT+2,R0     ;THIS SHOULD BE UNCHANGED ALSO
 5136 032146  001401                           BEQ     7$
 5137 032150  104455                           PERR31
```

```
 5140 032152  105737  002363          7$:     TSTB    UPPFLG          ;WHICH LOOP ?
 5141 032156  001003                          BNE     8$              ;SECOND, BR OUT
 5142 032160  105237  002363                  INCB    UPPFLG          ;FIRST, KEEP GOING
 5143 032164  000751                          BR      5$
 5144 032166  005737  002356          8$:     TST     DBEMSK+2        ;LAST BIT ?
 5145 032172  100405                          BMI     9$              ;MINUS - BIT 31
 5146 032174                                  DLEFT   DBEMSK
 5147 032204  000653                          BR      1$
 5148 032206                          9$:     IF #SW11 SET.IN @SWR THEN GOTO 10$
 5149 032216                                  IF QVFLAG IS TRUE THEN GOTO 10$
 5150 032224  005737  002352                  TST     SBEMSK+2        ;LAST BIT IN THIS MASK ?
 5151 032230  100406                          BMI     10$             ;BR IF LAST BIT
 5152 032232                                  DLEFT   SBEMSK
 5153 032242  000137  031722                  JMP     T12B
 5154 032246  105737  002362          10$:    TSTB    PASFLG  ;FIRST PASS ?
 5155 032252  001004                          BNE     11$             ;BR IF SECOND
 5156 032254  105237  002362                  INCB    PASFLG  ;INDICATE SECOND PASS COMING
 5157 032260  000137  031700                  JMP     T12A
 5158 032264  104471                  11$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5159 032266  013701  002506                  MOV     TESTADD,R1      ;RESTORE TEST ADDRESS
 5160 032272  005021                          CLR     (R1)+           ;CLEAR ANY DBE'S FROM TEST
 5161 032274  005011                          CLR     (R1)
 5162 032276  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 5163 032300  000207                          RETURN
```

```
 5167 032302                            MTP017: SUBTST  <<MTP017        HOLDING 1'S & 0'S TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP017  HOLDING 1'S & 0'S TEST
                                        ;*****************************************************************************
 5168                                           ;*(1)    THIS TEST CHECKS THE MEMORY FOR THE CAPABILITY
 5169                                           ;*       OF HOLDING 1'S AND 0'S BY WRITING A BACKGROUND
 5170                                           ;*       OF 000377 AND READING IT
 5171                                           ;*(2)    MEMORY IS WRITTEN USING A BYTE AT A TIME
 5172                                           ;*(3)    STEPS 1 & 2 ARE REPEATED WITH A SWAPPED BACKGROUND PATTERN
 5173                                           ;NOTE:   THIS TEST WRITES BYTES & READS WORDS
 5174 032302  012701  060000                   MOV      #FIRST,R1
 5175 032306  010104                           MOV      R1,R4
 5176 032310  012705  160000                   MOV      #LAST+2,R5
 5177 032314  012700  000377                   MOV      #377,R0         ;GET THE PATTERN INTO R0
 5178 032320  010003                           MOV      R0,R3
 5179 032322  000303                           SWAB     R3
 5180 032324  110021                    1$:    MOVB     R0,(R1)+        ;WRITE A BYTE
 5181 032326  110321                           MOVB     R3,(R1)+        ;WRITE THE MEMORY WITH THE BYTE STORED IN BAKPAT+1
 5182 032330  020105                           CMP      R1,R5           ;COMPARE TEST LOC TO TOP + 2
 5183 032332  103774                           BLO      1$              ;BRANCH IF LOWER
 5184
 5185 032334  014102                    2$:    MOV      -(R1),R2
 5186 032336  020002                           CMP      R0,R2           ;TEST THE MEMORY TO SEE IF IT CONTAINS
 5187                                                                   ;THE WORD STORED IN BAKPAT
 5188 032340  001401                           BEQ      3$
 5189 032342  104446                           PERR22
 5190
 5191 032344  020104                    3$:    CMP      R1,R4           ;KEEP ON TESTING THE MEMORY UNTIL
 5192 032346  101372                           BHI      2$              ;R1 EQUALS THE LOWEST ADDRESS
 5193 032350  000303                           SWAB     R3              ;CHANGE THE DATA PATTERN
 5194 032352  000300                           SWAB     R0
 5195 032354  001763                           BEQ      1$              ;IF THE DATA PATTERN DOES NOT HAVE LOW
 5196                                                                   ; BYTE =0 THEN FALL THRU
 5197 032356  000207                           RETURN
```

```
5201 032360                          MTP020: SUBTST  <<MTP020        MARCHING 1'S & 0'S IN CHECK BITS TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MTP020  MARCHING 1'S & 0'S IN CHECK BITS TEST
                                     ;*****************************************************************************
5202                                         ;*THIS TEST IS CONCERNED ONLY WITH THE INTEGRITY
5203                                         ;*OF THE MOS RAMS THAT STORE THE CHECKBITS.
5204
5205                                         ;WRITE UP       ;100 --> CHECKBITS
5206 032360  010311             MTP20A: MOV     R3,(R1)         ;V177640
5207 032362  010461  000002             MOV     R4,2(R1)        ;V177642
5208 032366  060201                     ADD     R2,R1           ;V177646
5209 032370  020105                     CMP     R1,R5           ;V177650        ;TOP + 2 ?
5210 032372  103772                     BLO     MTP20A          ;V177652        ;BR IF NOT
5211 032374  000207                     RETURN                  ;V177654
5212
5213                                         ;100 --> 077 DOWN
5214 032376  160201             MTP20B: SUB     R2,R1           ;V177640
5215 032400  020461  000002             CMP     R4,2(R1)        ;V177642        ;2ND WORD OK?
5216 032404  001002                     BNE     21$             ;V177646        ;NO - SKIP
5217 032406  005711                     TST     (R1)            ;V177650        ;1ST WORD OK?
5218 032410  001401                     BEQ     3$              ;V177652        ;YES - SKIP
5219 032412  104452             21$:    PERR26                  ;V177654        ;GOOD=000000,,100000,,100
5220 032414  010361  000002     3$:     MOV     R3,2(R1)        ;V177656
5221 032420  010311                     MOV     R3,(R1)         ;V177662
5222 032422  020100                     CMP     R1,R0           ;V177664
5223 032424  001364                     BNE     MTP20B          ;V177666
5224 032426  000207                     RETURN                  ;V177670
5225
5226                                         ;077 --> 100 UP
5227 032430  005711             MTP20C: TST     (R1)            ;V177640        ;1ST WORD OK?
5228 032432  001003                     BNE     41$             ;V177642        ;NO - SKIP
5229 032434  005761  000002             TST     2(R1)           ;V177644        ;2ND WORD OK?
5230 032440  001401                     BEQ     5$              ;V177650        ;YES - SKIP
5231 032442  104453             41$:    PERR27                  ;V177652        ;GOOD=000000,,000000,,077
5232 032444  010311             5$:     MOV     R3,(R1)         ;V177654        ;WRITE 1ST WORD
5233 032446  010461  000002             MOV     R4,2(R1)        ;V177656        ;WRITE 2ND WORD
5234 032452  060201                     ADD     R2,R1           ;V177662
5235 032454  020105                     CMP     R1,R5           ;V177664        ;TOP + 2 YET?
5236 032456  103764                     BLO     MTP20C          ;V177666        ;NO - LOOP
5237 032460  000207                     RETURN                  ;V177670
5238
5239                                         ;100 --> 077 UP
5240 032462  005711             MTP20D: TST     (R1)            ;V177640        ;1ST WORD OK?
5241 032464  001003                     BNE     61$             ;V177642        ;NO - SKIP
5242 032466  020461  000002             CMP     R4,2(R1)        ;V177644        ;2ND WORD OK?
5243 032472  001401                     BEQ     7$              ;V177650        ;YES - SKIP
5244 032474  104452             61$:    PERR26                  ;V177652
5245 032476  010311             7$:     MOV     R3,(R1)         ;V177654
5246 032500  010361  000002             MOV     R3,2(R1)        ;V177656
5247 032504  060201                     ADD     R2,R1           ;V177662
5248 032506  020105                     CMP     R1,R5           ;V177664        ;TOP + 2 YET?
5249 032510  103764                     BLO     MTP20D          ;V177666        ;NO - LOOP
5250 032512  000207                     RETURN                  ;V177670
```

```
5253                                        ;077 --> 100 DOWN
5254 032514  160201                MTP20E:  SUB     R2,R1          ;V177640
5255 032516  005761  000002                 TST     2(R1)          ;V177642        2ND WORD OK?
5256 032522  001002                         BNE     81$            ;V177646       ,NO - SKIP
5257 032524  005711                         TST     (R1)           ;V177650       ,1ST WORD OK?
5258 032526  001401                         BEQ     9$             ;V177652       ,YES - SKIP
5259 032530  104453                81$:     PERR27                 ;V177654
5260 032532  010461  000002        9$:      MOV     R4,2(R1)       ;V177656       ;WRITE 2ND WORD
5261 032536  010311                         MOV     R3,(R1)        ;V177662       ;WRITE 1ST WORD
5262 032540  020100                         CMP     R1,R0          ;V177664       ;BOTTOM YET?
5263 032542  001364                         BNE     MTP20E         ;V177666       ;NO - LOOP
5264 032544  000207                         RETURN                 ;V177670
5265
5266                                        ;100 UP
5267 032546  005711                MTP20F:  TST     (R1)           ;V177640       ;1ST WORD OK?
5268 032550  001003                         BNE     101$           ;V177642       ;NO - SKIP
5269 032552  020461  000002                CMP     R4,2(R1)       ;V177642       ;2ND WORD OK?
5270 032556  001401                         BEQ     11$            ;V177646       ;YES - SKIP
5271 032560  104452                101$:    PERR26                 ;V177650
5272 032562  060201                11$:     ADD     R2,R1          ;V177652
5273 032564  020105                         CMP     R1,R5          ;V177654       ;TOP + 2 YET?
5274 032566  103767                         BLO     MTP20F         ;V177656       ;NO - LOOP
5275 032570  000207                         RETURN                 ;V177660
```

```
5279 032572                            MTPA20: SUBTST  <<MTPA20        SLOW MARCHING 1'S & 0'S IN CHECK BITS TEST>>
                                       ;*************************************************************************
                                       ;*SUBTEST       MTPA20  SLOW MARCHING 1'S & 0'S IN CHECK BITS TEST
                                       ;*************************************************************************
5280                                           ;*THIS TEST IS CONCERNED ONLY WITH THE INTEGRITY
5281                                           ;*OF THE MOS RAMS THAT STORE THE CHECKBITS.
5282 032572                                    SET     SBEFLAG
5283 032600  013737  002144  002150            MOV     CSR,SBECSR
5284 032606  013737  002146  002152            MOV     CSR+2,SBECSR+2
5285 032614  013701  002336                    MOV     CSRFIRST,R1     ;FIRST TEST LOC
5286 032620  013702  002414                    MOV     CSRINC,R2
5287 032624  010103                            MOV     R1,R3
5288 032626  005004                            CLR     R4
5289 032630  012705  160000                    MOV     #LAST+2,R5
5290 032634  005037  002144                    CLR     CSR
5291 032640  104505                            CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
5292
5293                                           ;*************************************************************
5294 032642  010411                    2$:     MOV     R4,(R1)         ;WRITE CHECKBITS BY WRITING LOC     * WRITE UP
5295 032644  062701                            ADD     R2,R1           ;POINT TO NEXT WORD                 * 0'S --> CHK BITS
5296 032646  020105                            CMP     R1,R5           ;TOP + 2                            *
5297 032650  103774                            BLO     2$              ;BR IF NOT                          *
5298                                           ;*************************************************************
5299
5300                                           ;*************************************************************
5301 032652  160201                    3$:     SUB     R2,R1           ;ADJUST R1                          *
5302 032654  005711                            TST     (R1)            ;READ                               *
5303 032656  104426                            READCSR                 ;                                   *
5304 032660  032737  077400  002144            BIT     #77400,@#CSR    ;SHOULD BE ALL ZEROS                *
5305 032666  001406                            BEQ     4$              ;BR IF OK                           *
5306 032670  013700  002144                    MOV     CSR,R0          ;                                   *
5307 032674  000300                            SWAB    R0              ;                                   *
5308 032676  042700  000200                    BIC     #200,R0         ;                                   *
5309 032702  104435                            PERR11                  ;                                   *
5310                                                                   ;                                   *
5311 032704  012737  077400  002144    4$:     MOV     #77400,@#CSR    ;MAKE CHECKBITS ALL 1'S             *0'S --> 1'S
5312 032712  104505                            CHK1DIS                 ;DSABL ECC & WRITE CHKBTS FROM 1 CSR  * DOWN
5313 032714  005104                            COM     R4              ;COMP THE DATA                      *
5314 032716  010411                            MOV     R4,(R1)         ;WRITE THE CHECKBITS                *
5315 032720  020103                            CMP     R1,R3           ;BOTTOM YET?                        *
5316 032722  001353                            BNE     3$              ;BR IF NO                           *
5317                                           ;*************************************************************
5318
5319 032724  005037  002144                    CLR     CSR
5320 032730  104505                            CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
```

```
5323                                    ;*************************************************************************
5324 032732  005711                5$:  TST     (R1)              ;READ THE LOC AGAIN                          *
5325 032734  104426                     READCSR                  ;                                            *
5326 032736  013700  002144             MOV     @#CSR,R0         ;GET CSR CONTENTS INTO R0                    *
5327 032742  042700  100377             BIC     #100377,R0       ;ONLY WANT BITS 11-5                         *
5328 032746  022700  077400             CMP     #77400,R0        ;READ FOR ALL 1'S                            *
5329 032752  001404                     BEQ     6$               ;BR IF OK                                    *
5330 032754  000300                     SWAB    R0               ;                                            *
5331 032756  042700  000200             BIC     #200,R0          ;                                            *
5332 032762  104445                     PERR21                   ;                                            *1'S --> 0'S
5333                                                              ;                                            * UP
5334 032764  005037  002144         6$: CLR     CSR              ;                                            *
5335 032770  104505                     CHK1DIS                  ;DSABL ECC & WRITE CHKBTS FROM 1 CSR         *
5336 032772  005104                     COM     R4               ;                                            *
5337 032774  010411                     MOV     R4,(R1)          ;ACCESS THE LOC                              *
5338 032776  060201                     ADD     R2,R1            ;POINT TO NEXT ADDRESS                       *
5339 033000  020105                     CMP     R1,R5            ;TOP+2 YET?                                  *
5340 033002  103753                     BLO     5$               ;BR IF NOT                                   *
5341                                    ;*************************************************************************
5342
5343 033004  010301                     MOV     R3,R1
5344
5345                                    ;*************************************************************************
5346 033006  005711                7$:  TST     (R1)              ;READ                                        *
5347 033010  104426                     READCSR                  ;                                            *
5348 033012  032737  077400  002144     BIT     #77400,@#CSR     ;CHECKBITS SHOULD BE ZERO                    *
5349 033020  001406                     BEQ     8$               ;BR IF OK                                    *
5350 033022  013700  002144             MOV     CSR,R0           ;                                            *
5351 033026  000300                     SWAB    R0               ;                                            *
5352 033030  042700  000200             BIC     #200,R0          ;                                            *
5353 033034  104435                     PERR11                   ;                                            *0'S --> 1'S
5354                                                              ;                                            * UP
5355 033036  012737  077400  002144 8$: MOV     #77400,@#CSR     ;COMP CHECKBITS                              *
5356 033044  104505                     CHK1DIS                  ;DSABL ECC & WRITE CHKBTS FROM 1 CSR         *
5357 033046  005104                     COM     R4               ;                                            *
5358 033050  010411                     MOV     R4,(R1)          ;WRITE THE LOC                               *
5359 033052  060201                     ADD     R2,R1            ;POINT TO NEXT ADDRESS                       *
5360 033054  020105                     CMP     R1,R5            ;TOP+2 YET?                                  *
5361 033056  103753                     BLO     7$               ;BR IF NOT                                   *
5362                                    ;*************************************************************************
5363
5364 033060  005037  002144             CLR     CSR
5365 033064  104505                     CHK1DIS                  ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
```

```
5368                                    ;*****************************************************************
5369 033066  160201                9$:  SUB     R2,R1             ;ADJUST R1                          *
5370 033070  005711                     TST     (R1)              ;READ                               *
5371 033072  104426                     READCSR                   ;                                   *
5372 033074  013700  002144             MOV     @#CSR,R0          ;GET CSR CONTENTS                   *
5373 033100  042700  100377             BIC     #100377,R0        ;ONLY WANT CHECKBITS                *
5374 033104  022700  077400             CMP     #77400,R0         ;ALL 1'S?                           *
5375 033110  001404                     BEQ     10$               ;BR IF OK                           *
5376 033112  000300                     SWAB    R0                ;                                   *
5377 033114  042700  000200             BIC     #200,R0           ;                                   *
5378 033120  104445                     PERR21                    ;                                   *1'S --> 0'S
5379                                                              ;                                   * DOWN
5380 033122  005037  002144        10$: CLR     CSR               ;                                   *
5381 033126  104505                     CHK1DIS                   ;DSABL ECC & WRITE CHKBTS FROM 1 CSR *
5382 033130  005104                     COM     R4                ;COMP THE DATA                      *
5383 033132  010411                     MOV     R4,(R1)           ;WRITE THE CHECKBITS                *
5384 033134  020103                     CMP     R1,R3             ;BOTTOM YET?                        *
5385 033136  001353                     BNE     9$                ;BR IF NO                           *
5386                                    ;*****************************************************************
5387
5388                                    ;*****************************************************************
5389 033140  005711                11$: TST     (R1)              ;READ                               *
5390 033142  104426                     READCSR                   ;                                   *
5391 033144  032737  077400  002144     BIT     #77400,@#CSR      ;SHOULD BE ALL 0'S                  *
5392 033152  001406                     BEQ     12$               ;BR IF OK                           *
5393 033154  013700  002144             MOV     CSR,R0            ;                                   *
5394 033160  000300                     SWAB    R0                ;                                   *
5395 033162  042700  000200             BIC     #200,R0           ;                                   *
5396 033166  104435                     PERR11                    ;                                   *0'S
5397                                                              ;                                   * UP
5398 033170  060201                12$: ADD     R2,R1             ;POINT TO NEXT WORD                 *
5399 033172  005037  002144             CLR     CSR               ;                                   *
5400 033176  104505                     CHK1DIS                   ;DSABL ECC & WRITE CHKBTS FROM 1 CSR *
5401 033200  020105                     CMP     R1,R5             ;TOP + 2 YET?                       *
5402 033202  103756                     BLO     11$               ;BR IF NOT                          *
5403                                    ;*****************************************************************
5404
5405                                    ;FLUSH OUT ALL THESE DBE'S
5406 033204                             BMOV    MTP030
5407 033212  012700  060000             MOV     #FIRST,R0
5408 033216  012701  040000             MOV     #SIZE,R1
5409 033222  104471                     ECC1DIS                   ;DISABLE ECC ON 1 SELECTED CSR
5410 033224  004737  177640             CALL    FASTCITY                  ;CALL TO THE USER INSTRUCTION PAR'S
5411 033230  104503                     CLR1CSR                   ;CLEAR 1 SELECTED Mx11 CSR
5412 033232  000207                     RETURN
```

```
5416 033234                          MTPA21: SUBTST  <<MTPA21        MARCHING 1'S & 0'S PATTERN TEST>>
                                     ;*************************************************************************
                                     ;*SUBTEST        MTPA21  MARCHING 1'S & 0'S PATTERN TEST
                                     ;*************************************************************************
5417                                         ;READ,BYTESWAP-MODIFY,READ,DOWN
5418 033234  014100                  1$:     MOV     -(R1),R0;V177640
5419 033236  020200                          CMP     R2,R0   ;V177642
5420 033240  001401                          BEQ     2$      ;V177644
5421 033242  104443                          PERR17          ;V177646
5422
5423 033244  000311                  2$:     SWAB    (R1)    ;V177650
5424 033246  011100                          MOV     (R1),R0 ;V177652
5425 033250  020300                          CMP     R3,R0   ;V177654
5426 033252  001401                          BEQ     3$      ;V177656
5427 033254  104444                          PERR20          ;V177660
5428
5429 033256  020401                  3$:     CMP     R4,R1   ;V177662        ;DONE?
5430 033260  001365                          BNE     1$      ;V177664        ;NO - LOOP
5431 033262  000207                          RETURN          ;V177666        ;YES - RETURN
5432
5433 033264                          MTPB21: ;READ,BYTESWAP-MODIFY,READ,UP
5434 033264  011100                  1$:     MOV     (R1),R0 ;V177640
5435 033266  020300                          CMP     R3,R0   ;V177642
5436 033270  001401                          BEQ     2$      ;V177644
5437 033272  104444                          PERR20          ;V177646
5438
5439 033274  000311                  2$:     SWAB    (R1)    ;V177650
5440 033276  011100                          MOV     (R1),R0 ;V177652
5441 033300  020200                          CMP     R2,R0   ;V177654
5442 033302  001401                          BEQ     3$      ;V177656
5443 033304  104443                          PERR17          ;V177660
5444
5445 033306  062701  000002          3$:     ADD     #2,R1   ;V177662
5446 033312  020501                          CMP     R5,R1   ;V177666        ;DONE?
5447 033314  001363                          BNE     1$      ;V177670        ;NO - LOOP
5448 033316  000207                          RETURN          ;V177672        ;YES - RETURN
5449
5450 033320                          MTPC21: ;READ,BYTESWAP-MODIFY,READ,UP
5451 033320  011100                  1$:     MOV     (R1),R0 ;V177640
5452 033322  020200                          CMP     R2,R0   ;V177642
5453 033324  001401                          BEQ     2$      ;V177644
5454 033326  104443                          PERR17          ;V177646
5455
5456 033330  000311                  2$:     SWAB    (R1)    ;V177650
5457 033332  011100                          MOV     (R1),R0 ;V177652
5458 033334  020300                          CMP     R3,R0   ;V177654
5459 033336  001401                          BEQ     3$      ;V177656
5460 033340  104444                          PERR20          ;V177660
5461
5462 033342  062701  000002          3$:     ADD     #2,R1   ;V177662
5463 033346  020501                          CMP     R5,R1   ;V177666        ;DONE?
5464 033350  001363                          BNE     1$      ;V177670        ;NO - LOOP
5465 033352  000207                          RETURN          ;V177672        ;YES - RETURN
```

```
 5468 033354                    MTPD21: ;READ,BYTESWAP-MODIFY,READ,DOWN
 5469 033354  014100            1$:     MOV     -(R1),R0;V177640
 5470 033356  020300                    CMP     R3,R0   ;V177642
 5471 033360  001401                    BEQ     2$      ;V177644
 5472 033362  104444                    PERR20          ;V177646
 5473
 5474 033364  000311            2$:     SWAB    (R1)    ;V177650
 5475 033366  011100                    MOV     (R1),R0 ;V177652
 5476 033370  020200                    CMP     R2,R0   ;V177654
 5477 033372  001401                    BEQ     3$      ;V177656
 5478 033374  104443                    PERR17          ;V177660
 5479
 5480 033376  020401            3$:     CMP     R4,R1   ;V177662        ;DONE?
 5481 033400  001365                    BNE     1$      ;V177664        ;NO - LOOP
 5482 033402  000207                    RETURN          ;V177666        ;YES - RETURN
 5483
```

```
 5487 033404                        MTP022: SUBTST  <<MTP022        REFRESH & SHIFTING DIAGONAL TEST>>
                                    ;*********************************************************************
                                    ;*SUBTEST        MTP022  REFRESH & SHIFTING DIAGONAL TEST
                                    ;*********************************************************************
 5488                                       ;(1)    WE WRITE A DIAGONAL PATTERN IN MEMORY (WITH CACHE ON).
 5489                                       ;(2)    IF A REFRESH TEST WE DISTURB ALL ROWS FOR > 2 MS (WITH CACHE ON).
 5490                                       ;(3)    WE READ & CHECK FOR CORRECTNESS THE DIAGONAL PATTERN
 5491                                       ;       (WITH CACHE OFF).
 5492          000010               KDIAG=8.                ;HOW OFTEN A DIAGONAL STRIPE OCCURS (MUST BE A POWER OF 2)
 5493 033404                              FOR EVEN := #1 TO #2                    ;FOR DATA & COMPLEMENT DATA
 5494 033412                                IF EVEN EQ #1
 5495 033422                                  LET R2 := ZEROS
 5496 033426                                  LET R3 := ONES
 5497 033432                                ELSE
 5498 033434                                  LET R2 := ONES
 5499 033440                                  LET R3 := ZEROS
 5500 033444                                END ;OF IF EVEN
 5501 033444                                FOR STRIPES := #0 TO #KDIAG-1           ;FOR THE NUMBER OF STRIPES
 5502
 5503                                         ;WRITE LOOP
 5504 033450  104423                         CACHON                          ;TURN CACHE ON
 5505 033452                                 LET COUNT := STRIPES
 5506 033460                                 LET R1 := #FIRST
 5507 033464                                 WHILE R1 LOS #LAST
 5508 033472                                   IF COUNT LT #0 THEN LET COUNT := #KDIAG-1
 5509 033506                                   IF #374 OFF.IN R1 THEN LET COUNT := COUNT - #1
 5510 033520                                   IF COUNT NE #0
 5511 033526                                     LET (R1) := R2
 5512 033530                                     LET 2(R1) := R2
 5513 033536                                   ELSE
 5514 033536                                     LET (R1) := R3
 5515 033540                                     LET 2(R1) := R3
 5516 033544                                   END ;OF IF COUNT
 5517 033544                                   LET COUNT := COUNT - #1
 5518 033550                                   LET R1 := R1 + #4
 5519 033554                                 END ;OF WHILE
 5520                                        ;END OF WRITE LOOP
 5521
 5522 033556                                 IF DIAGFLAG IS FALSE THEN $CALL REFRESH
```

```
                                        ;READ LOOP
                                        LET COUNT := STRIPES
                                        LET R1 := #FIRST
                                        CACHOFF                         ;TURN CACHE OFF
                                        WHILE R1 LOS #LAST
                                          IF COUNT LT #0 THEN LET COUNT := #KDIAG-1
                                          IF #374 OFF.IN R1 THEN LET COUNT :- COUNT - #1
                                          IF COUNT NE #0
                                            LET R0 := (R1)
                                            IF R2 NE R0
                                              PERR17
                                            END ;OF IF R2
                                            LET R0 := 2(R1)
                                            IF R2 NE R0
                                              PERR17
                                            END ;OF IF R2
                                          ELSE
                                            LET R0 := (R1)
                                            IF R3 NE R0
                                              PERR20
                                            END ;OF IF R3
                                            LET R0 := 2(R1)
                                            IF R3 NE R0
                                              PERR20
                                            END ;OF IF R3
                                          END ;OF IF COUNT
                                          LET COUNT := COUNT - #1
                                          LET R1 := R1 + #4
                                        END ;OF WHILE
                                        ;END OF READ LOOP

                                      END ;OF FOR STRIPES
                                    END ;OF FOR EVEN
                                    RETURN
                                REFRESH:SUBTST  <<SUBR  REFRESH DELAY>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    REFRESH DELAY
                                ;*****************************************************************************
                                    ;DISTURB EACH ROW FOR > 3.2 MS
                                    FOR R0 := #FIRST TO #FIRST+374 BY #4
                                      CALL REFSUB
                                    END ;OF FOR R0
                                    LET R0 := #FIRST+BIT14
                                    WHILE R0 LOS #LAST+BIT14+374
                                      CALL REFSUB
                                      LET R0 := R0 + #4
                                    END ;OF WHILE
                                    RETURN
034030 012704 000640            REFSUB: MOV     #640,R4                 ;TIME FOR A > 3.2 MS LOOP
034034 062700 000002                    ADD     #2,R0
034040 005140                   1$:     COM     -(R0)
034042 005120                           COM     (R0)+
034044 005110                           COM     (R0)
034046 005110                           COM     (R0)
034050 077405                           SOB     R4,1$
034052 162700 000002                    SUB     #2,R0
034056 000207                           RETURN
```

```
5582 034060                            MTPA24: SUBTST  <<MTPA24        FAST GALLOPING PATTERN TEST>>
                                       ;*************************************************************************
                                       ;*SUBTEST        MTPA24  FAST GALLOPING PATTERN TEST
                                       ;*************************************************************************
5583                                           ;THE TOTAL TEST (INCLUDING SETUP) IS AS FOLLOWS
5584                                           ;*(1)   THIS TEST WRITES THE MEMORY WITH A BACK GROUND PATTERN
5585                                           ;*      STORED AT LOCATION BAKPAT
5586                                           ;*(2)   TEST BEGINS AT LOWEST LOCATION BEING TESTED
5587                                           ;*      (LETS NAME IT 'A')
5588                                           ;*(3)   LETS NAME THE 1ST LOCATION IN THE ROW/COLUMN UNDER TEST AS 'B'.
5589                                           ;*(4)   SWAPS BYTES FOR LOCATION 'A'.
5590                                           ;*(5)   READS 'A', READS 'B'
5591                                           ;*(6)   'B' = 'B'+400   (ADDS 64 DOUBLE WORDS TO 'B')
5592                                           ;*(7)   REPEATS STEPS 5 AND 6 UNTIL 'B' IS GREATER THAN THE
5593                                           ;*(8)   END OF THE BANK  A+2
5594                                           ;*(9)   REPEATS  STEPS 3-8 UNTILL 'A' REACHES THE END OF THE BANK
5595                                           ;*(10)  AFTER EXECUTING THE TEST  DATA IS COMPLEMENTED
5596                                           ;*      AND STEPS 1-9 ARE REPEATED
5597                                           ;REGISTERS ARE USED AS FOLLOWS
5598                                           ;R0     TEST DATA
5599                                           ;R1     'A'
5600                                           ;R2     'B'
5601                                           ;R3     BAKPAT
5602                                           ;R4     SWAPAT
5603                                           ;R5     LAST
5604
5605                                           ;NOTE THE PATTERN STARTS AT MTPB24!!!!!!
5606
5607                                           ;UIPAR'S
5608 034060  011100                    1$:     MOV     (R1),R0         ;V177640        ;READ 'A'
5609 034062  020004                            CMP     R0,R4           ;V177642        ;CHECK 'A'
5610 034064  001401                            BEQ     2$              ;V177644        ;BR IF OK
5611 034066  104447                            PERR23                  ;V177646        ;REPORT ERROR
5612
5613 034070  011200                    2$:     MOV     (R2),R0         ;V177650        ;READ 'B'
5614 034072  020003                            CMP     R0,R3           ;V177652        ;CHECK 'B'
5615 034074  001401                            BEQ     3$              ;V177654        ;BR IF OK
5616 034076  104450                            PERR24                  ;V177656        ;REPORT ERROR
5617
5618 034100  062702  000400            3$:     ADD     #400,R2         ;V177660        ;BUMP 'B'
5619 034104  020205                            CMP     R2,R5           ;V177664        ;AT END YET?
5620 034106  101764                            BLOS    1$              ;V177666        ;BR IF NO
5621
5622 034110  062701  000002                    ADD     #2,R1           ;V177670        ;BUMP 'A'
5623 034114  000137  172260                    JMP     @#SDPAR0        ;V177674        ;GOTO V177260
```

```
5626 034120                          MTPB24: SUBTST  <<MTPB24        FAST GALLOP PART B>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MTPB24  FAST GALLOP PART B
                                     ;*****************************************************************************
5627                                         ;SDPAR'S
5628 034120  010411                          MOV     R4,(R1)         ;V172260        ;WRITE 'A'
5629 034122  020105                          CMP     R1,R5           ;V172262        ;DONE?
5630 034124  001001                          BNE     1$              ;V172264        ;BR IF NO
5631 034126  000207                          RETURN                  ;V172266        ;YES - RETURN
5632 034130  000137  172360          1$:     JMP     @#KDPAR0        ;V172270        ;GOTO V172360
5633
5634 034134                          MTPC24: SUBTST  <<MTPC24        FAST GALLOP PART C>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MTPC24  FAST GALLOP PART C
                                     ;*****************************************************************************
5635                                         ;KDPAR'S
5636 034134  010102                          MOV     R1,R2           ;V172360        ;RESET 'B' <--- 'A'
5637 034136  011100                          MOV     (R1),R0         ;V172362        ;READ 'A'
5638 034140  020004                          CMP     R0,R4           ;V172364        ;CHECK 'A'
5639 034142  001401                          BEQ     1$              ;V172366        ;BR IF OK
5640 034144  104447                          PERR23                  ;V172370        ;REPORT ERROR
5641 034146  000137  177660          1$:     JMP     @#UDPAR0        ;V172372        ;GOTO V177660
```

```
5645 034152                                MTP025: SUBTST  <<MTP025         ;INTERRUPT ENABLE TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MTP025  INTERRUPT ENABLE TEST
                                           ;*****************************************************************************
5646 034152  005037  002344                        CLR     TSTDAT          ;GENERATE CHECKBITS ON 0,,0
5647 034156  005037  002346                        CLR     TSTDAT+2
5648 034162  012737  002344  002402                MOV     #TSTDAT,SOURCE
5649 034170  004737  040540                        CALL    CHKGEN
5650 034174  012737  000003  002100                MOV     #3,NOPAR                ;SETUP PARITY ACTION
5651 034202  013701  002506                        MOV     TESTADD,R1      ;FIRST TEST ADDRESS
5652 034206  012737  034242  002372                MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
5653 034214  004737  034464                        CALL    MTPA25          ;WRITE DATA & CHECKBITS
5654 034220  104473                               ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
5655 034222  005711                               TST     (R1)            ;ACCESS LOCATIONS FOR DBE TRAPS
5656 034224  005761  000002                        TST     2(R1)
5657                                               ;NONE - GOOD - ACCESS FOR SBE TRAPS
5658 034230  104507                               ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
5659 034232  005711                               TST     (R1)
5660 034234  005761  000002                        TST     2(R1)
5661 034240  000404                               BR      2$              ;NONE - GOOD - SKIP
5662 034242  104426                        1$:    READCSR
5663 034244                                        FATAL   27
5664 034252  005237  002344                 2$:    INC     TSTDAT          ;CHECK FOR CORRECT ACTION ON SBE'S
5665 034256  004737  034412                        CALL    MTPD25          ;IN ALL 4 BYTES
5666 034262  012737  000400  002344                MOV     #400,TSTDAT
5667 034270  004737  034412                        CALL    MTPD25
5668 034274  005037  002344                        CLR     TSTDAT
5669 034300  005237  002346                        INC     TSTDAT+2
5670 034304  004737  034412                        CALL    MTPD25
5671 034310  012737  000400  002346                MOV     #400,TSTDAT+2
5672 034316  004737  034412                        CALL    MTPD25
5673
5674 034322  005037  002346                        CLR     TSTDAT+2        ;CHECK FOR CORRECT ACTION ON DBE'S
5675 034326  012737  000003  002344                MOV     #3,TSTDAT       ;IN ALL 4 BYTES
5676 034334  004737  034434                        CALL    MTPE25
5677 034340  012737  001400  002344                MOV     #1400,TSTDAT
5678 034346  004737  034434                        CALL    MTPE25
5679 034352  005037  002344                        CLR     TSTDAT
5680 034356  012737  000003  002346                MOV     #3,TSTDAT+2
5681 034364  004737  034434                        CALL    MTPE25
5682 034370  012737  001400  002346                MOV     #1400,TSTDAT+2
5683 034376  004737  034434                        CALL    MTPE25
5684 034402  104503                               CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
5685 034404  005037  002100                        CLR     NOPAR           ;INDICATE PARITY ACTION
5686 034410  000207                               RETURN
5687
5688 034412  004737  034464                MTPD25: CALL    MTPA25          ;WRITE DATA & CHECKBITS
5689 034416  104471                               ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
5690 034420  004737  034504                        CALL    MTPB25          ;CHECK FOR NO TRAPS
5691 034424  104507                               ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
5692 034426  004737  034536                        CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
5693 034432  000207                               RETURN
```

```
 5696 034434  004737  034464          MTPE25: CALL    MTPA25          ;WRITE DATA & CHECKBITS
 5697 034440  104471                          ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5698 034442  004737  034504                  CALL    MTPB25          ;CHECK FOR NO TRAPS
 5699                                         ;ENABLE DBE TRAPS
 5700 034446  104473                          ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
 5701 034450  004737  034536                  CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
 5702 034454  104507                          ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
 5703 034456  004737  034536                  CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
 5704 034462  000207                          RETURN
 5705
 5706                                         ;WRITE TSTDAT & TSTDAT+2 & CHECKBITS
 5707 034464  104471                  MTPA25: ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5708 034466  013711  002344                  MOV     TSTDAT,(R1)     ;WRITE FIRST 16 BITS
 5709 034472  104475                          CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 5710 034474  013761  002346  000002          MOV     TSTDAT+2,2(R1)  ;WRITE 2ND 16 BITS & CHECKBITS
 5711 034502  000207                          RETURN
 5712
 5713                                         ;CHECK FOR NO TRAP OCCURING CONDITION
 5714 034504  012737  034522  002372  MTPB25: MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
 5715 034512  005711                          TST     (R1)            ;ACCESS LOCATIONS
 5716 034514  005761  000002                  TST     2(R1)
 5717 034520  000207                          RETURN                  ;NO TRAP - GOOD - RETURN
 5718
 5719 034522  104426                  1$:     READCSR
 5720 034524  104024                          ERROR   +24
 5721 034526                                  SET     HEADER
 5722 034534  000207                          RETURN
 5723
 5724                                         ;TRAP SHOULD OCCURE TEST
 5725 034536  012737  034550  002372  MTPC25: MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
 5726 034544  005711                          TST     (R1)            ;ACCESS 1ST LOCATION
 5727 034546  000405                          BR      2$              ;NO TRAP - BAD NEWS - SKIP
 5728 034550  012737  034574  002372  1$:     MOV     #3$,PARTHERE    ;SETUP TRAP DESTINATION
 5729 034556  005761  000002                  TST     2(R1)           ;ACCESS 2ND LOCATION
 5730 034562  104426                  2$:     READCSR                 ;NO TRAP - BAD NEWS
 5731 034564  104025                          ERROR   +25
 5732 034566                                  SET     HEADER
 5733 034574  000207                  3$:     RETURN
 5734
```

```
                                MTPA26: SUBTST  <<MTPA26        RANDOM DATA (WRITE)>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTPA26  RANDOM DATA (WRITE)
                                ;*****************************************************************************
 5739 034576  000137  172360   1$:     JMP     KDPAR0          ;V177640        GOTO V172360
 5740 034602  010221            MOV     R2,(R1)+        ;V177644
 5741 034604  010321            MOV     R3,(R1)+        ;V177646
 5742 034606  077005            SOB     R0,1$           ;V177650
 5743 034610  000207            RETURN                  ;V177652
 5744
 5745 034612                    MTPB26: SUBTST  <<MTPB26        RANDOM DATA (READ)>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTPB26  RANDOM DATA (READ)
                                ;*****************************************************************************
 5746                           .DSABL  AMA
 5747                           .ENABL  LSB
 5748 034612  000137  172360   1$:     JMP     @#KDPAR0        ;V177640        GOTO V172360
 5749 034616  020221            CMP     R2,(R1)+        ;V177644
 5750 034620  001401            BEQ     2$              ;V177646
 5751 034622  104451            PERR25                  ;V177650
 5752 034624  005127            2$:     COM     (PC)+           ;V177652
 5753 034626  000000            RANODD: 0                       ;V177654        FOR ERROR REPORTING
 5754 034630  020321            CMP     R3,(R1)+        ;V177656
 5755 034632  001401            BEQ     3$              ;V177660
 5756 034634  104451            PERR25                  ;V177662
 5757 034636  005167  177764   3$:     COM     RANODD          ;V177664
 5758 034642  077015            SOB     R0,1$           ;V177670
 5759 034644  000207            RETURN                  ;V177672
 5760                           .DSABL  LSB
 5761                           .ENABL  AMA
 5762
 5763 034646                    MTPC26: SUBTST  <<RANDOM NUMBER SUBPROGRAM>>
                                ;*****************************************************************************
                                ;*SUBTEST        RANDOM NUMBER SUBPROGRAM
                                ;*****************************************************************************
 5764                           ;CALLER MUST SETUP
 5765                           ;       MOV     SEEDLO,R3
 5766                           ;       MOV     SEEDHI,R2
 5767                           ;       MOV     R3,R5
 5768                           ;       MOV     R2,R4
 5769 034646  073427  000007           ASHC    #7,R4           ;V172360
 5770 034652  060305            ADD     R3,R5           ;V172364
 5771 034654  005504            ADC     R4              ;V172366
 5772 034656  060204            ADD     R2,R4           ;V172370
 5773 034660  062705  001057           ADD     #1057,R5        ;V172372
 5774 034664  000730            BR      .-116           ;V172376        GOTO V172260
 5775
 5776 034666                    MTPD26: SUBTST  <<RANDOM NUMBER SUBSUBPROGRAM>>
                                ;*****************************************************************************
                                ;*SUBTEST        RANDOM NUMBER SUBSUBPROGRAM
                                ;*****************************************************************************
 5777 034666  005504            ADC     R4              ;V172260
 5778 034670  062704  047401           ADD     #47401,R4       ;V172262
 5779 034674  010503            MOV     R5,R3           ;V172266
 5780 034676  010402            MOV     R4,R2           ;V172270
 5781 034700  000137  177644           JMP     UIPAR2          ;V172272        GOTO V177644
```

```
 5784 034704                            MTP030: SUBTST  <<MT0030        FLUSH OUT DBE'S>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MT0030  FLUSH OUT DBE'S
                                        ;*****************************************************************************
 5785 034704  011002                    1$:     MOV     (R0),R2         ;V177640
 5786 034706  010220                            MOV     R2,(R0)+        ;V177642
 5787 034710  077103                            SOB     R1,1$           ;V177644
 5788 034712  000207                            RETURN                  ;V177646
 5789
 5790 034714                            MTP031: SUBTST  <<MTP031        SOB-A-LONG TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP031  SOB-A-LONG TEST
                                        ;*****************************************************************************
 5791                                           .DSABL  AMA
 5792 034714  000000                            0                       ;MOVE TERMINATOR
 5793 034716  077001                    1$:     SOB     R0,1$           ;SOB TILL R0 UNDERFLOWS
 5794 034720  005167  177772                    COM     1$              ;WRITE COMPLEMENT OF SOB
 5795 034724  020167  177766                    CMP     R1,1$           ;READ & CHECK FOR NOT ''SOB R0,DOT''
 5796 034730  001403                            BEQ     2$              ;OK - SKIP
 5797 034732  104454                            PERR30
 5798 034734  010167  177756                    MOV     R1,1$
 5799 034740  005167  177752            2$:     COM     1$              ;CORRECT SOB INSTRUCTION
 5800 034744  010200                            MOV     R2,R0           ;REINITIALIZE SOB CONSTANT
 5801                                           ;UPDATE MOVE REGISTERS
 5802 034746  010503                            MOV     R5,R3
 5803 034750  005725                            TST     (R5)+           ;BUMP (SAFELY) BY 2
 5804 034752  010504                            MOV     R5,R4
 5805 034754  020527  160000                    CMP     R5,#LAST+2      ;DONE?
 5806 034760  001001                            BNE     3$              ;NO - SKIP
 5807 034762  000207                            RETURN                  ;YES
 5808
 5809 034764  014344                    3$:     MOV     -(R3),-(R4)
 5810 034766  001376                            BNE     3$
 5811 034770  000752                            BR      1$
 5812         000056                    SOBLENGTH=.-MTP031
 5813                                           .ENABL  AMA
```

```
 5816 034772                            MTPA32: SUBTST  <<MTPA32        SKEWED UP ADDRESS TEST (WRITE)>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPA32  SKEWED UP ADDRESS TEST (WRITE)
                                        ;*********************************************************************
 5817 034772  062704  000006           1$:     ADD     #6,R4           ;V177640        ;ADD OFFSET TO OFFSET COUNTER
 5818 034776  042704  177771                   BIC     #^C6,R4         ;V177644        ;MASK TO (0,2,4,6)
 5819 035002  010301                           MOV     R3,R1           ;V177650        ;PUT IN LSB'S OF ADDRESS
 5820 035004  060401                           ADD     R4,R1           ;V177652        ;PUT IN MSB'S OF ADDRESS
 5821 035006  010011                           MOV     R0,(R1)         ;V177654        ;WRITE DATA IN R0 INTO MEMORY
 5822 035010  062703  000010                   ADD     #10,R3          ;V177656        ;BUMP ADDRESS MSB TO NEXT BLOCK OF 4 WORDS
 5823 035014  077512                           SOB     R5,1$           ;V177662        ;LOOP TILL DONE
 5824 035016  000207                           RETURN                  ;V177664
 5825
 5826 035020                            MTPB32: SUBTST  <<MTPB32        SKEWED UP ADDRESS TEST (READ)>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPB32  SKEWED UP ADDRESS TEST (READ)
                                        ;*********************************************************************
 5827 035020  062704  000006           1$:     ADD     #6,R4           ;V177640        ;ADD OFFSET TO OFFSET COUNTER
 5828 035024  042704  177771                   BIC     #^C6,R4         ;V177644        ;MASK TO (0,2,4,6)
 5829 035030  010301                           MOV     R3,R1           ;V177650        ;PUT IN LSB'S OF ADDRESS
 5830 035032  060401                           ADD     R4,R1           ;V177652        ;PUT IN MSB'S OF ADDRESS
 5831 035034  011102                           MOV     (R1),R2         ;V177654        ;READ DATA INTO R0
 5832 035036  020200                           CMP     R2,R0           ;V177656        ;IS IT CORRECT?
 5833 035040  001401                           BEQ     2$              ;V177660        ;YES - SKIP
 5834 035042  104446                           PERR22                  ;V177662        ;NO - PRINT ERROR
 5835 035044  062703  000010           2$:     ADD     #10,R3          ;V177664        ;BUMP ADDRESS MSB TO NEXT BLOCK OF 4 WORDS
 5836 035050  077515                           SOB     R5,1$           ;V177666        ;LOOP TILL DONE
 5837 035052  000207                           RETURN                  ;V177670
 5838
 5839 035054                            MTP033: SUBTST  <<MTP033        WRITE RECOVERY TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTP033  WRITE RECOVERY TEST
                                        ;*********************************************************************
 5840                                           ;THE TEST ACTUALLY EXECUTED ALREADY IN THE MEMORY UNDER TEST.
 5841                                           ;THIS CODE INSURES THAT IT CHANGED MEMORY TO HAVE
 5842                                           ;1/2 BANK OF #5141      WHICH IS A "COM -(R1)" INSTRUCTION AND
 5843                                           ;1/2 BANK OF #110       WHICH IS A "JMP (R0)"   INSTRUCTION.
 5844
 5845 035054  012401                   1$:     MOV     (R4)+,R1        ;V177640        ;GET DATA FROM LOWER 1/2 BANK
 5846 035056  020102                           CMP     R1,R2           ;V177642        ;IS IT #5141?
 5847 035060  001401                           BEQ     2$              ;V177644        ;YES - SKIP
 5848 035062  104430                           PERR02                  ;V177646        ;NO - TAKE ERROR TRAP
 5849 035064  077305                   2$.     SOB     R3,1$           ;V177650        ;LOOP FOR 1/2 BANK
 5850 035066  012703  020000                   MOV     #SIZE/2,R3      ;V177652        ;RESTORE LOOP SIZE
 5851 035072  012400                   3$:     MOV     (R4)+,R0        ;V177656        ;GET DATA FROM UPPER 1/2 BANK
 5852 035074  020005                           CMP     R0,R5           ;V177660        ;IS IT #110?
 5853 035076  001401                           BEQ     4$              ;V177662        ;YES - SKIP
 5854 035100  104427                           PERR01                  ;V177664        ;NO- TAKE ERROR TRAP
 5855 035102  077305                   4$:     SOB     R3,3$           ;V177666        ;LOOP FOR 1/2 BANK
 5856 035104  000207                           RETURN
```

```
 5859 035106                            MTP034: SUBTST  <<MTP034        BRANCH GOBBLE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP034  BRANCH GOBBLE TEST
                                        ;*****************************************************************************
 5860                                           .DSABL  AMA
 5861 035106  000000                    BGTEST: 0                       ;MOVE TERMINATOR
 5862 035110  000000                            0                       ;TEST WORD (TWO BYTES)
 5863 035112  000261                    BRGOBB: SEC                     ;SET CARRY (TO BE ADDED TO 'BGTEST')
 5864 035114  105511                            ADCB    (R1)            ;INCREMENT LOW BYTE OF 'BGTEST'
 5865 035116  100402                            BMI     1$              ;BRANCH WHEN BIT7 IS SET
 5866 035120  105212                            INCB    (R2)            ;INCREMENT HIGH BYTE OF 'BGTEST'
 5867 035122  000773                            BR      BRGOBB          ;LOOP 128 TIMES
 5868
 5869                                           ;NOW CHECK FOR CORRECT CONDITION CODES
 5870 035124  102401                    1$.     BVS     2$              ;BR IF V-BIT SET (SHOULD BE)
 5871 035126  104461                            PERR35                  ;NO - REPORT ERROR AND ABORT TEST
 5872                                                                   ;COND CODES NOT EQUAL TO 1010
 5873 035130  000242                    2$:     CLV                     ;CLEAR V-BIT
 5874 035132  105212                            INCB    (R2)            ;INCREMENT HIGH BYTE OF 'BGTEST' ONCE MORE
 5875 035134  103402                            BCS     3$              ;BR IF C-BIT SET (SHOULD NOT BE)
 5876 035136  102001                            BVC     3$              ;BR IF V-BIT CLEAR (SHOULD NOT BE)
 5877 035140  100401                            BMI     4$              ;BR IF N-BIT SET (SHOULD BE)
 5878 035142  104461                    3$:     PERR35                  ;NO - REPORT ERROR AND ABORT TEST
 5879                                                                   ;COND CODES NOT EQUAL TO 1010
 5880
 5881                                           ;UPDATE TEST POINTERS
 5882 035144  010701                    4$:     MOV     PC,R1
 5883 035146  162701  000036            5$:     SUB     #5$-BGTEST,R1
 5884 035152  010102                            MOV     R1,R2
 5885 035154  005202                            INC     R2
 5886
 5887                                           ;UPDATE MOVE REGISTERS
 5888 035156  010503                            MOV     R5,R3
 5889 035160  005725                            TST     (R5)+           ;BUMP (SAFELY) BY 2
 5890 035162  010504                            MOV     R5,R4
 5891
 5892                                           ;DONE?
 5893 035164  020527  160000                    CMP     R5,#LAST+2      ;DONE?
 5894 035170  001001                            BNE     6$              ;NO - SKIP
 5895 035172  000207                            RETURN                  ;YES - RETURN
 5896
 5897                                           ;MOVE CODE 1 LOCATION
 5898 035174  014344                    6$:     MOV     -(R3),-(R4)
 5899 035176  001376                            BNE     6$
 5900 035200  005011                            CLR     (R1)            ;CLEAR TEST WORD 'BGTEST'
 5901 035202  000743                            BR      BRGOBB          ;RUN MOVED CODE AGAIN
 5902         000076                    GBLENGTH=.-MTP034
 5903                                           .ENABL  AMA
```

```
                                        .SBTT   !SC SUBROUTINES

                                REGCOPY:SUBTS   <<SUBR  COPY R0 TO R4,R1 TO R3, & R2 TO R5>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    COPY R0 TO R4,R1 TO R3, & R2 TO R5
                                ;*****************************************************************************
                                        MOV     R0,R4
                                        MOV     R1,R3
                                        MOV     R2,R5
                                        RETURN

                                FLIPWARN:SUBTST <<FLIP WARNING CONSTANTS IN WORST CASE NOISE TESTS>>
                                ;*****************************************************************************
                                ;*SUBTEST        FLIP WARNING CONSTANTS IN WORST CASE NOISE TESTS
                                ;*****************************************************************************
                                        PUSH    R0
                                        INC     FLIPLOC
                                        BIC     #^C3,FLIPLOC
                                        CMP     #1,FLIPLOC
                                        BEQ     1$
                                        CMP     #2,FLIPLOC
                                        BEQ     2$
                                        CMP     #3,FLIPLOC
                                        BEQ     3$
                                        CLR     R0
                                        MOV     ONES,R4
                                        BR      4$
                                1$:     CLEAR   R0,R4
                                        BR      4$
                                2$:     MOV     #401,R0
                                        MOV     ONES,R4
                                        BR      4$
                                3$:     MOV     #401,R0
                                        MOV     #401,R4
                                4$:     MOV     R0,WARN2
                                        MOV     R0,WARN3
                                        MOV     R0,WARN4
                                        MOV     R0,WARN5
                                        POP     R0
                                        RETURN

                                BACKGND:SUBTST  <<SUBR  WRITE BACKGROUND>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    WRITE BACKGROUND
                                ;*****************************************************************************
                                        ;WRITES DATA FROM R2
                                        SAVREG
                                        MOV     #FIRST,R0
                                        MOV     #SIZE,R1
                                        BMOV    MTP000
                                WARN6:  MOV     #207,UIPAR2             ;WARNING PUTTING 'RETURN' INSTRUCTION AFTER WRITE
                                        CALL    SUPD01
                                        RESREG
                                        RETURN
```

```
5953 035402                                PCONFIG:SUBTST  <<SUBR  PRINT CONFIGURATION MAP>>
                                           ;*********************************************************************
                                           ;*SUBTEST        SUBR    PRINT CONFIGURATION MAP
                                           ;*********************************************************************
5954 035402                                        PUSH    TKVEC,TKVEC+2,R0
5955 035414  010637  035662                        MOV     SP,PCONFS               ;SAVE LAST GOOD SP
5956 035420  012737  035630  000060                MOV     #PCONF2,TKVEC
5957 035426  012737  000340  000062                MOV     #340,TKVEC+2
5958 035434  017700  145334                        MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
5959 035440  042737  000200  177776                BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
5960 035446  052777  000100  145316                BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
5961
5962 035454                                        TYPE    MSG001
5963 035460                                        TYPE    MSG002
5964 035464                                        TYPE    MSG003
5965                                               ;IF FAT PAPER ON TERMINAL GOTO 1$
5966 035470                                        IF #SW4 SET.IN @SWR THEN JUMPTO PCONF1
5967 035504  012700  000074                        MOV     #60.,R0
5968 035510  010004                                MOV     R0,R4
5969 035512                                        CLEAR   R1,R3
5970 035516                                        TYPE    MSG004
5971 035522  004737  035664                        CALL    TCONFIG                 ;GO TYPE CONFIGURATION (1ST HALF)
5972 035526                                        TYPE    $CRLF
5973 035532                                        TYPE    MSG017                  ;PRINT SPACE(S)
5974 035536                                        TYPE    MSG011
5975 035542                                        TYPE    $CRLF
5976 035546                                        TYPE    MSG017                  ;PRINT SPACE(S)
5977 035552                                        TYPE    MSG012
5978 035556  012701  000550                        MOV     #60.*2*3,R1
5979 035562  010103                                MOV     R1,R3
5980 035564  004737  035664                        CALL    TCONFIG
5981 035570  000417                                BR      PCONF2
5982
5983 035572  012700  000170          PCONF1:       MOV     #120.,R0
5984 035576  010004                                MOV     R0,R4
5985 035600                                        CLEAR   R1,R3
5986 035604                                        TYPE    MSG014                  ;SPACE
5987 035610                                        TYPE    MSG011
5988 035614                                        TYPE    MSG004
5989 035620                                        TYPE    MSG012
5990 035624  004737  035664                        CALL    TCONFIG
5991
5992 035630  013706  035662          PCONF2:       MOV     PCONFS,SP               ;RESTORE STACK
5993 035634  042777  000100  145130                BIC     #BIT6,@$TKS
5994 035642  117700  145126                        MOVB    @$TKB,R0                ;READ CHAR TO KILL FLAG
5995 035646                                        POP     R0,TKVEC+2,TKVEC
5996 035660  000207                                RETURN
5997
5998 035662  000000          PCONFS:       0                                       ;STACK SAVED HERE.
```

```
6002 035664                                    SUBTST  <<SUBR  TYPE CONFIGURATION>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SUBR    TYPE CONFIGURATION
                                       ;*****************************************************************************
                                       ;*****************************************************************************
6003
6004                                   ;CALL:  MOV     #N,R0           ;N=NUMBER OF CHARACTERS
6005                                   ;       MOV     R0,R4           ;BACKUP
6006                                   ;       MOV     #K,R1           ;INDEX CONSTANT
6007                                   ;       MOV     R1,R3           ;BACKUP
6008                                   ;       CALL    TCONFIG         ;ACTUAL CALL
6009                                   ;       RETURN                  ;ONLY RETURN
6010                                   ;*****************************************************************************
6011
6012                                           ;***********
6013                                           ;** ERROR **
6014                                           ;***********
6015 035664                            TCONFIG:TYPE    MSG005
6016 035670  032761  004000  003016     1$:     BIT     #BIT11,CONFIG(R1)       ;ERROR ON THIS BANK?
6017 035676  001403                            BEQ     2$                      ;NO - SKIP
6018 035700                                    TYPE    MSG013                  ;PRINT 'X'
6019 035704  000402                            BR      3$
6020 035706                            2$:     TYPE    MSG014                  ;PRINT SPACE
6021 035712  062701  000006             3$:     ADD     #6,R1                   ;BUMP POINTER
6022 035716  077014                            SOB     R0,1$                   ;LOOP TILL DONE
6023 035720  010400                            MOV     R4,R0
6024 035722  010301                            MOV     R3,R1
6025
6026                                           ;***********
6027                                           ;** CPU'S **
6028                                           ;***********
6029 035724                                    TYPE    MSG008
6030 035730  016105  003016             4$:     MOV     CONFIG(R1),R5
6031 035734  072527  177774                    ASH     #-4,R5                  ;GET CPU BITS
6032 035740  042705  177760                    BIC     #^C17,R5                ;CLEAR NON INTERESTING BITS
6033 035744  022705  000012                    CMP     #10.,R5
6034 035750  100003                            BPL     8$
6035 035752  062705  000067                    ADD     #67,R5                  ;MAKE NUMBERS OVER 9 HEX
6036 035756  000402                            BR      9$
6037 035760  062705  000060             8$:     ADD     #60,R5                  ;MAKE ASCII
6038 035764  110537  112134             9$.     MOVB    R5,MSG015               ;PLUG INTO MEMORY
6039 035770                                    TYPE    MSG015
6040 035774  062701  000006                    ADD     #6,R1                   ;BUMP POINTER
6041 036000  077025                            SOB     R0,4$                   ;LOOP TILL DONE
6042 036002  010400                            MOV     R4,R0
6043 036004  010301                            MOV     R3,R1
```

```
 6046                                                ;****************
 6047                                                ;** INTERLEAVE **
 6048                                                ;****************
 6049 036006                                         TYPE    MSG007
 6050                                                ;THIS IS AN ENTRY POINT FROM ERROR REPORTS
 6051 036012  016105  003016            TCFIG1:      MOV     CONFIG(R1),R5
 6052 036016  072527  177763                         ASH     #-13.,R5                ;GET MEMORY TYPE
 6053 036022  042705  177774                         BIC     #^C3,R5                 ;CLEAR NON INTERESTING BITS
 6054 036026  005705                                 TST     R5
 6055 036030  001004                                 BNE     1$
 6056 036032  112737  000077  112134                 MOVB    #'?,MSG015
 6057 036040  000435                                 BR      7$
 6058 036042  016105  003016            1$:          MOV     CONFIG(R1),R5
 6059 036046  042705  177770                         BIC     #^C7,R5                 ;GET INTERLEAVE BITS
 6060 036052  022705  000001                         CMP     #1,R5
 6061 036056  001002                                 BNE     2$
 6062 036060  006305                                 ASL     R5                      ;2 TO 1
 6063 036062  000420                                 BR      5$
 6064 036064  022705  000002            2$:          CMP     #2,R5
 6065 036070  001002                                 BNE     3$
 6066 036072  006305                                 ASL     R5                      ;4 TO 1
 6067 036074  000413                                 BR      5$
 6068 036076  022705  000004            3$:          CMP     #4,R5
 6069 036102  001003                                 BNE     4$
 6070 036104  012705  000010                         MOV     #8.,R5                  ;8 TO 1
 6071 036110  000405                                 BR      5$
 6072 036112  005705                    4$:          TST     R5
 6073 036114  001403                                 BEQ     5$
 6074 036116  012705  000077                         MOV     #'?,R5
 6075 036122  000402                                 BR      6$
 6076 036124  062705  000060            5$:          ADD     #60,R5                  ;MAKE ASCII
 6077 036130  110537  112134            6$:          MOVB    R5,MSG015               ;PLUG INTO MEMORY
 6078 036134                            7$:          TYPE    MSG015
 6079 036140                                         IF NOTAB NE #0 THEN $RETURN
 6080 036150  062701  000006                         ADD     #6,R1                   ;BUMP POINTER
 6081 036154  077062                                 SOB     R0,TCFIG1               ;LOOP TILL DONE
 6082 036156  010400                                 MOV     R4,R0
 6083 036160  010301                                 MOV     R3,R1
 6084
 6085                                                ;****************
 6086                                                ;** MEMORY TYPE **
 6087                                                ;****************
 6088                                                .ENABL  LSB
 6089 036162                                         TYPE    MSG009
 6090 036166  016105  003016            8$:          MOV     CONFIG(R1),R5
 6091 036172  072527  177763                         ASH     #-13.,R5                ;GET MEMORY TYPE
 6092 036176  042705  177774                         BIC     #^C3,R5                 ;CLEAR NON INTERESTING BITS
 6093 036202                                         IF R5 EQ #1
 6094 036210  112737  000113  112134                   MOVB  #'K,MSG015
 6095 036216                                         ELSE
 6096 036220                                           IF #SLAVE3.SLAVE2.SLAVE1.MASTER SET.IN CONFIG(R1)
 6097 036230  112737  000112  112134                     MOVB        #'J,MSG015
 6098 036236                                           ELSE
 6099 036240  112737  000060  112134                     MOVB        #'0,MSG015
 6100 036246                                           END ;OF IF #SLAVE3 SLAVE2!SLAVE1 MASTER
 6101 036246                                         END ;OF IF R5
 6102 036246                                         TYPE    MSG015
```

```
6103 036252  062701  000006                ADD     #6,R1                   ;BUMP POINTER
6104 036256  077035                        SOB     R0,8$                   ;LOOP TILL DONE
6105 036260  010400                        MOV     R4,R0
6106 036262  010301                        MOV     R3,R1
6107                                       .DSABL  LSB
6108
6109                                       ;*********
6110                                       ;** BOX **
6111                                       ;*********
6112 036264                                TYPE    MSG016
6113 036270  016105  003016          9$:   MOV     CONFIG(R1),R5
6114 036274  032705  000010                BIT     #BIT3,R5                ;EXTERNAL INTERLEAVE?
6115 036300  001404                        BEQ     10$                     ;NO - SKIP
6116 036302  112737  000115  112134        MOVB    #'M,MSG015              ;INDICATE MULTIPLE BOXES
6117 036310  000417                        BR      12$
6118 036312  032705  020014          10$:  BIT     #BIT13!14,R5            ;MJ11?
6119 036316  001004                        BNE     11$                     ;NO - SKIP
6120 036320  112737  000077  112134        MOVB    #'?,MSG015              ;I DON'T KNOW HOW MJ11'S INTERLEAVE
6121 036326  000410                        BR      12$
6122 036330  072527  177770          11$:  ASH     #-8.,R5                 ;GET BOX NUMBER
6123 036334  042705  177774                BIC     #^C3,R5                 ;CLEAR NON INTERESTING BITS
6124 036340  062705  000060                ADD     #60,R5                  ;MAKE ASCII
6125 036344  110537  112134                MOVB    R5,MSG015               ;PLUG INTO MEMORY
6126 036350                        12$:    TYPE    MSG015
6127 036354  062701  000006                ADD     #6,R1                   ;BUMP POINTER
6128 036360  077035                        SOB     R0,9$                   ;LOOP TILL DONE
6129 036362  010400                        MOV     R4,R0
6130 036364  010301                        MOV     R3,R1
6131
6132                                       ;***************
6133                                       ;** PROTECTED **
6134                                       ;***************
6135 036366                                TYPE    MSG010
6136 036372  005761  003016          13$:  TST     CONFIG(R1)              ;BANK PROTECTED?
6137 036376  100004                        BPL     14$                     ;NO - SKIP
6138 036400  112737  000120  112134        MOVB    #'P,MSG015
6139 036406  000407                        BR      15$
6140 036410  032761  010000  003016  14$:  BIT     #BIT12,CONFIG(R1)       ;PROTECTED REGION OF MK11 BOX?
6141 036416  001406                        BEQ     16$                     ;NO - SKIP
6142 036420  112737  000113  112134        MOVB    #'K,MSG015
6143 036426                        15$:    TYPE    MSG015
6144 036432  000402                        BR      17$
6145 036434                        16$:    TYPE    MSG014                  ;PRINT SPACE
6146 036440  062701  000006          17$:  ADD     #6,R1                   ;BUMP POINTER
6147 036444  077026                        SOB     R0,13$                  ;LOOP TILL DONE
6148 036446  010400                        MOV     R4,R0
6149 036450  010301                        MOV     R3,R1
6150 036452  000207                        RETURN
```

```
                                        .SBTTL  TRAP    PARITY ERROR HANDLER
                                ;*****************************************************************************
                                ;VECTOR TO HERE FROM TRAPS TO 114
                                ;IGNORE ERRORS BUT COUNT IF NOPAR FLAG = 1.
                                ;*****************************************************************************
                                ;
                                ;       CODE    ACTION
                                ;
                                ;       --0--   PRINT "UNEXPECTED PARITY TRAP
                                ;         1     COUNT ERROR & SAVE 1ST IN 'PADDRESS'
                                ;         2     SET 'ABORT' / SETUP 'BADPC' / RETURN VIA PCBUMP
                                ;         3     RETURN VIA 'PARTHERE'
                                ;         4     COUNT ERROR & SAVE 1ST IN 'PADDRESS' REGARDLESS OF ERROR REGISTER
                                ;
036454  022737  000001  002100  PARITY: CMP     #1,NOPAR                ;COUNTING PARITY ERRORS?
036462  001023                          BNE     3$                      ;NO - SKIP
036464  032737  000001  177744          BIT     #BIT0,MEMERR            ;MEMORY TIMEOUT?
036472  001402                          BEQ     1$                      ;NO - SKIP
036474  000137  036646                  JMP     NONEXIST                ;YES - SIMULATE A TRAP TO 4
036500  005237  002074          1$:     INC     PARCNT                  ;PARITY ERROR COUNTER + 1
036504  022737  000001  002074          CMP     #1,PARCNT               ;FIRST PARITY ERROR?
036512  001003                          BNE     2$                      ;NO - SKIP
036514  013737  177740  002042          MOV     LOADRS,PADDRESS         ;SAVE 1ST BAD PARITY ADDRESS
036522  013737  177744  177744  2$:     MOV     MEMERR,MEMERR           ;CLEAR ERROR BITS
036530  000002                          RTI
036532  022737  000002  002100  3$:     CMP     #2,NOPAR                ;ACTION CODE - 2 ?
036540  001016                          BNE     6$                      ;NO - SKIP
036542                                  SET     ABORTFLAG               ;YES
036550  004737  036770                  CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036554  063716  002406                  ADD     PCBUMP,(SP)             ;UPDATE RETURN PC
036560  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR ERROR BITS
036566  042766  000004  000002          BIC     #BIT2,2(SP)             ;SHOW FAILURE BY .NE.
036574  000002                          RTI
036576  022737  000003  002100  6$:     CMP     #3,NOPAR                ;ACTION CODE - 3 ?
036604  001006                          BNE     7$                      ;NO - SKIP
036606  013716  002372                  MOV     PARTHERE,(SP)
036612  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR ERROR BITS
036620  000002                          RTI
036622  022737  000004  002100  7$:     CMP     #4,NOPAR
036630  001001                          BNE     8$
036632  000722                          BR      1$

036634  004737  036770          8$:     CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036640                                  FATAL   32
```

```
                                        .SBTTL  TRAP    NON-EXISTANT MEMORY (HOLES) HANDLER
                                ;***************************************************************************
                                ;VECTOR TO HERE (SOMETIMES) FROM TRAPS TO 4
                                ;       CODE IN NONEM DETERMINES ACTION AS FOLLOWS:
                                ; 1)    IGNORE ERRORS BUT COUNT IF NONEM (NO NON-EXISTANT MEMORY) FLAG = 1.
                                ; 2)    TO EXIT PATTERN 0 DURING SIZING IF NON-EXIST MEM ERROR
                                ;***************************************************************************

036646  022737  000001  002102  NONEXIST:CMP     #1,NONEM                ;COUNTING NON-EXISTANT MEMORY ERRORS?
036654  001014                          BNE     2$                      ;NO - SKIP
036656  005237  002072                  INC     NEMCNT                  ;BUMP NON-EXISTANT MEMORY COUNTER
036662  022737  000001  002072          CMP     #1,NEMCNT               ;FIRST ERROR?
036670  001005                          BNE     1$                      ;NO - SKIP
036672  010037  002040                  MOV     R0,ADDRESS              ;ASSUME R0 CONTAINS THE ADDRESS ACCESSED
036676  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR OUT HIADRS & LOADRS REG'S
036704  000002                  1$:     RTI
036706  005237  002072          2$:     INC     NEMCNT                  ;BUMP NON-EXISTANT MEMORY COUNTER
036712  012701  000001                  MOV     #1,R1                   ;DUMMY UP R1 FOR A FORCED SOB EXIT
036716  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR OUT HIADRS & LOADRS REG'S
036724  000002                          RTI

                                ;***************************************************************************
                                        .SBTTL  TRAP    TIMEOUT (TRAP TO 4) HANDLER
036726  004737  036770          TIMEOUT:CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036732                                  FATAL   6
                                ;***************************************************************************
                                        .SBTTL  TRAP    MEMORY MANAGEMENT (TRAP TO 250) HANDLER
036740  004737  036770          MMTRAP: CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036744                                  FATAL   7
                                        .SBTTL  TRAP    RESERVED INSTRUCTION HANDLER
036752  004737  036770          PDP1105:CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036756                                  FATAL   5

036764                          IITRAP: SUBTST  <<UNEXPECTED IIST TRAP HANDLER>>
                                ;***************************************************************************
                                ;*SUBTEST        UNEXPECTED IIST TRAP HANDLER
                                ;***************************************************************************
036764  104057                          ERROR   +57
036766  000002                          RTI

036770                          BADSTACK:SUBTST <<FIND BAD SP, PC, & PSW FROM STACK>>
                                ;***************************************************************************
                                ;*SUBTEST        FIND BAD SP, PC, & PSW FROM STACK
                                ;***************************************************************************
036770  010637  002032                  MOV     SP,BADSP
036774  062737  000002  002032          ADD     #2,BADSP
037002  016637  000002  002026          MOV     2(SP),BADPC
037010  016637  000004  002036          MOV     4(SP),BADPSW
037016  000207                          RETURN
```

```
                                        .SBTTL  TRAP    KERNEL TRAP HANDLER
                                ;*******************************************************************************
                                ;KERNEL IS A TRAP THAT COMES HERE
                                ;*******************************************************************************
037020  042766  140000  000002  $KERNEL:        BIC     #140000,2(SP)
037026  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    ENERGIZE TRAP HANDLER
037030  052737  001001  177572  $ENERGIZE:BIS   #BIT9.BIT0,MMR0
037036  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    DEENERGIZE TRAP HANDLER
037040  042737  001001  177572  $DEENERGIZE:BIC #BIT9.BIT0,MMR0
037046  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    CACHON TRAP HANDLER
037050  013737  002700  177746  $CACHN: MOV     CACHK,CONTRL    ;SETUP CACHE AS PER CONSTANT (USUALLY 1 FOR Y ON)
037056  052737  000001  177746          BIS     #BIT0,CONTRL    ;DISABLE TRAPS (BUT NOT ABORTS)
037064  000002                  RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    CACHOFF TRAP HANDLER
                                        ;DISABLE TRAPS (NOT ABORTS), FORCE MISSES, FLUSH, BYPASS
037066  052737  001415  177746  $CACHF: BIS     #BIT0!BIT2!BIT3!BIT8.BIT9,CONTRL
037074  000002                  RTI
```

```
                                                .SBTTL  TRAP    LOAD CSR TRAP HANDLER
                                                ;LOAD CORRECT CSR WITH DATA IN CSR & CSR+2
037076                                  $LOADC: PUSH    R0
037100  012700  172100                          MOV     #MK11ADD,R0             ;CREATE CSR ADDRESS
037104  063700  002256                          ADD     CSRNO,R0
037110  005737  002254                          TST     CSRREL                  ;CSR'S RELOCATED?
037114  001014                                  BNE     $LOAD1                  ;YES - SKIP
037116  013720  002144                          MOV     CSR,(R0)+               ;LOAD IT
037122                                          IF TWOCSRS IS TRUE
037130  013710  002146                            MOV   CSR+2,(R0)
037134                                          ELSE
037136  042710  100000                            BIC   #BIT15,(R0)
037142                                          END ;OF IF TWOCSRS
037142                                          POP     R0
037144  000002                                  RTI
037146  042700  020000                  $LOAD1: BIC     #20000,R0
037152  013737  177746  002370                  MOV     CONTRL,OLDCACHE         ;SAVE CACHE STATUS
037160  104424                                  CACHOFF                         ;TURN CACHE OFF
037162  013720  002144                          MOV     CSR,(R0)+               ;LOAD IT
037166                                          IF TWOCSRS IS TRUE
037174  013710  002146                            MOV   CSR+2,(R0)
037200                                          ELSE
037202  042710  100000                            BIC   #BIT15,(R0)
037206                                          END ;OF IF TWOCSRS
037206  013737  002370  177746                  MOV     OLDCACHE,CONTRL         ;RESTORE CACHE
037214                                          POP     R0
037216  000002                                  RTI
```

```
                                                .SBTTL  TRAP    READ CSR TRAP HANDLER
                                                ;READ THE CORRECT CSR INTO LOCATIONS CSR & CSR+2
037220                                  $READC: PUSH    R0
037222  012700  172100                          MOV     #MK11ADD,R0             ;CREATE CSR ADDRESS
037226  063700  002256                          ADD     CSRNO,R0
037232  005737  002254                          TST     CSRREL                  ;CSR'S RELOCATED?
037236  001005                                  BNE     1$                      ;YES - SKIP
037240  012037  002144                          MOV     (R0)+,CSR               ;READ IT
037244  011037  002146                          MOV     (R0),CSR+2              ;READ IT
037250  000415                                  BR      2$
037252  042700  020000                  1$:     BIC     #20000,R0
037256  013737  177746  002370                  MOV     CONTRL,OLDCACHE         ;SAVE CACHE STATUS
037264  104424                                  CACHOFF                         ;TURN CACHE OFF
037266  012037  002144                          MOV     (R0)+,CSR               ;READ IT
037272  011037  002146                          MOV     (R0),CSR+2              ;READ IT
037276  013737  002370  177746                  MOV     OLDCACHE,CONTRL         ;RESTORE CACHE
037304                                  2$:     POP     R0
037306  000002                                  RTI
                                                .SBTTL  TRAP    TEST (R1) & READ CSR CAREFULLY
037310                                  $TSTRD: PUSH    R0
037312                                          BMOV    TSTRD1
037320  012700  172100                          MOV     #MK11ADD,R0             ;CREATE CSR ADDRESS
037324  063700  002256                          ADD     CSRNO,R0
037330  005737  002254                          TST     CSRREL                  ;CSR'S RELOCATED?
037334  001003                                  BNE     1$                      ;YES - SKIP
037336  004737  177640                          CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
037342  000413                                  BR      2$
037344  042700  020000                  1$:     BIC     #20000,R0
037350  013737  177746  002370                  MOV     CONTRL,OLDCACHE         ;SAVE CACHE STATUS
037356  104424                                  CACHOFF                         ;TURN CACHE OFF
037360  004737  177640                          CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
037364  013737  002370  177746                  MOV     OLDCACHE,CONTRL         ;RESTORE CACHE
                                                ;IF SINGLE BIT ERROR ONLY - SET CARRY BIT
037372                                  2$:     POP     R0
037374                                          IF #BIT4 SET.IN CSR AND #BIT15 OFF.IN CSR
037414  052766  000001  000002                    BIS   #BIT0,2(SP)
037422                                          ELSE
037424  042766  000001  000002                    BIC   #BIT0,2(SP)
037432                                          END ;OF IF #BIT4
037432  000002                                  RTI
                                        TSTRD1: CLR     (R0)                    ;V177640
037436                                          SUPERVISOR                      ;V177642 ;ENTER SUPERVISOR MODE
037444  105711                                  TSTB    (R1)                    ;V177646
037446  042737  140000  177776                  BIC     #BIT15!BIT14,PSW        ;V177650
037454  012037  002144                          MOV     (R0)+,CSR               ;V177656
037460  011037  002146                          MOV     (R0),CSR+2              ;V177662
037464  000207                                  RETURN                          ;V177666
```

```
                                        .SBTTL  TRAP    ECC DISABLE ALL CSR'S TRAP HANDLER
037466  012737  000002  002144  $ECCDIS:MOV     #BIT1,CSR
037474                                  IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
037510  005037  002146                  CLR     CSR+2
037514  004737  040442                  CALL    CSROUT
037520  000002                          RTI
                                        .SBTTL  TRAP    ECC DISABLE OF 1 SELECTED CSR TRAP HANDLER
037522  012737  000002  002144  $ECC1DIS:MOV    #BIT1,CSR
037530                                  IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
037544  005037  002146                  CLR     CSR+2
037550  104425                          LOADCSR
037552  000002                          RTI
                                        .SBTTL  TRAP    MK11 INITIALIZE ALL CSR'S TRAP HANDLER
037554  012737  000001  002144  $ECCINIT:MOV    #BIT0,CSR
037562  005037  002146                  CLR     CSR+2
037566  004737  040442                  CALL    CSROUT
037572  000002                          RTI
                                        .SBTTL  TRAP    MK11 INITIALIZE 1 SELECTED CSR TRAP HANDLER
037574  012737  000001  002144  $ECC1INIT:MOV   #BIT0,CSR
037602  005037  002146                  CLR     CSR+2
037606  104425                          LOADCSR
037610  000002                          RTI
                                        .SBTTL  TRAP    ENABLE SBE PARITY TRAPS ON ALL CSR'S
037612  012737  000003  002144  $ENASBE :MOV     #BIT0!BIT1,CSR
037620                                  IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
037634  005037  002146                  CLR     CSR+2
037640  004737  040442                  CALL    CSROUT
037644  000002                          RTI
                                        .SBTTL  TRAP    ENABLE SBE PARITY TRAPS ON 1 SELECTED CSR
037646  012737  000003  002144  $ENA1SBE:MOV    #BIT0!BIT1,CSR
037654                                  IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
037670  005037  002146                  CLR     CSR+2
037674  104425                          LOADCSR
037676  000002                          RTI
                                        .SBTTL  TRAP    WRITE CHECKBITS THRU ALL CSR'S TRAP HANDLER
037700  013737  002404  002144  $CBCSR: MOV     CHECK,CSR               ;BITS 14-8
037706  052737  000006  002144          BIS     #BIT1!BIT2,CSR          ;CHECK MODE
037714                                  IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
037730  005037  002146                  CLR     CSR+2
037734  004737  040442                  CALL CSROUT
037740  000002                          RTI
                                        .SBTTL  TRAP    WRITE CHECKBITS THRU 1 SELECTED CSR TRAP HANDLER
037742  013737  002404  002144  $CB1CSR:MOV     CHECK,CSR               ;BITS 14-8
037750  052737  000006  002144          BIS     #BIT1!BIT2,CSR          ;CHECK MODE
037756                                  IF KPFLAG IS TRUE THEN LET CSR :  CSR SET.BY #BIT3
037772  005037  002146                  CLR     CSR+2
037776  104425                          LOADCSR
040000  000002                          RTI
```

```
 6405                                                  .SBTTL  TRAP    WAS THERE A SBE ON ANY CSR TRAP HANDLER
 6406 040002                                $WASSBE:PUSH    R1,R4
 6407 040006  013701  002334                        MOV     MKCSRS,R1       ;GET CSR'S BYTE
 6408 040012  005004                                CLR     R4
 6409 040014                                        BEGIN LWSBE
 6410 040014                                          FOR CSRNO := #0 TO #34 BY #4
 6411 040020  106301                                    ASLB        R1
 6412 040022                                            ON.ERROR
 6413 040024  104426                                      READCSR
 6414 040026                                              IF #BIT4 SET.IN CSR
 6415 040036                                                SET     R4
 6416 040042                                                LEAVE LWSBE
 6417 040044                                              END ;OF IF #BIT4
 6418 040044                                            END ;OF ON.ERROR
 6419 040044                                            IFB R1 EQ #0 THEN LEAVE LWSBE
 6420 040050                                          END ;OF FOR CSRNO
 6421 040066                                        END LWSBE
 6422 040066  006004                                ROR     R4              ;SET C BIT FOR ERROR
 6423 040070                                        POP     R4,R1
 6424 040074                                        ON.ERROR
 6425 040076  052766  000001  000002                 BIS   #BIT0,2(SP)
 6426 040104                                        ELSE
 6427 040106  042766  000001  000002                 BIC   #BIT0,2(SP)
 6428 040114                                        END ;OF ON.ERROR
 6429 040114  000002                                RTI
 6430                                                .SBTTL  TRAP    WAS THERE A SBE IN 1 SELECTED CSR TRAP HANDLER
 6431                                                ;ON RETURN IF CARRY IS SET THERE WAS A SBE
 6432 040116  104426                        $WAS1SBE:READCSR
 6433 040120  042766  000001  000002                BIC     #BIT0,2(SP)     ;CLR C BIT ON STACK
 6434 040126  032737  000020  002144                BIT     #BIT4,CSR
 6435 040134  001403                                BEQ     1$
 6436 040136  052766  000001  000002                BIS     #BIT0,2(SP)     ;SET C BIT ON STACK
 6437 040144  000002                        1$:     RTI
```

```
                                                .SBTTL  TRAP    WAS THERE A DBE ON ANY CSR TRAP HANDLER
040146                                  $WASDBE:PUSH    R1,R4
040152  013701  002334                          MOV     MKCSRS,R1       ;GET CSR'S BYTE
040156  005004                                  CLR     R4
040160                                          BEGIN LWDBE
040160                                            FOR CSRNO :- #0 TO #34 BY #4
040164  106301                                      ASLB        R1
040166                                            ON.ERROR
040170  104426                                      READCSR
040172                                            IF #BIT15 SET.IN CSR
040202                                              SET     R4
040206                                              LEAVE LWDBE
040210                                            END ;OF IF #BIT15
040210                                          END ;OF ON.ERROR
040210                                          IFB R1 EQ #0 THEN LEAVE LWDBE
040214                                        FND ;OF FOR CSRNO
040232                                        END LWDBE
040232  006004                                ROR     R4              ;SET C BIT FOR ERROR
040234                                        POP     R4,R1
040240                                        ON.ERROR
040242  052766  000001  000002                  BIS   #BIT0,2(SP)
040250                                        ELSE
040252  042766  000001  000002                  BIC   #BIT0,2(SP)
040260                                        END ;OF ON.ERROR
040260  000002                                RTI
                                                .SBTTL  TRAP    WAS THERE A DBE ON 1 SELECTED CSR TRAP HANDLER
                                                ;ON RETURN IF CARRY IS SET THERE WAS A DBE
040262  104426                          $WAS1DBE:READCSR
040264  005737  002144                          TST     CSR             ;DBE?
040270  100010                                  BPL     3$              ;NO - SKIP
040272  005737  002146                          TST     CSR+2           ;DBE IN OTHER WORD?
040276  100401                                  BMI     2$              ;YES - SKIP
040300  104021                                  ERROR   +21             ;NO - ONLY ONE FLAG POPPED UP
040302  052766  000001  000002  2$:             BIS     #BIT0,2(SP)     ;SET C BIT ON STACK
040310  000002                                  RTI
040312  042766  000001  000002  3$:             BIC     #BIT0,2(SP)     ;CLR C BIT ON STACK
040320  000002                                  RTI
```

```
                                                .SBTTL  TRAP    CLEAR ALL Mk11 CSR'S TRAP HANDLER
040322                                  $CLRCSR:CLEAR   CSR,CSR+2
040332  004737  040442                        CALL    CSROUT
040336  000002                                RTI
                                                .SBTTL  TRAP    CLEAR 1 SELECTED Mk11 CSR TRAP HANDLER
040340                                  $CLR1CSR:CLEAR  CSR,CSR+2
040350  104425                                LOADCSR
040352  000002                                RTI
                                                .SBTTL  TRAP    ECC DISABLE, CHECH MODE, & WRITE CHECKBITS IN ALL CSR'S TRAP HANDLER
                                                ;CHECKBITS ALREADY IN LOC ''CSR''
040354  052737  000006  002144          $CHKDIS:BIS     #BIT1!BIT2,CSR          ;ECC DISABLE & DIAG CHECK MODE
040362                                        IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
040376  005037  002146                        CLR     CSR+2
040402  004737  040442                        CALL    CSROUT
040406  000002                                RTI
                                                .SBTTL  TRAP    ECC DISABLE, CHECH MODE, & WRITE CHECKBIT'S IN 1 SELECTED CSR
                                                ;CHECKBITS ALREADY IN LOC ''CSR''
040410  052737  000006  002144          $CHK1DIS:BIS    #BIT1!BIT2,CSR          ;ECC DISABLE & DIAG CHECK MODE
040416                                        IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
040432  005037  002146                        CLR     CSR+2
040436  104425                                LOADCSR
040440  000002                                RTI
```

```
                                        CSROUT: SUBTST  <<SUBR  WRITE IN ALL CSR'S>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    WRITE IN ALL CSR'S
                                        ;*****************************************************************************
                                                PUSH    R1
040444  013701  002334                        MOV     MKCSRS,R1       ;GET CSR'S BYTE
040450                                          BEGIN LCSROUT
040450                                            FOR CSRNO :  #0 TO #34 BY #4
040454  106301                                      ASLB        R1
040456                                            ON.ERROR
040460  104425                                        LOADCSR
040462                                            END ;OF ON.ERROR
040462                                            IFB R1 EQ #0 THEN LEAVE LCSROUT
040466                                          END ;OF FOR CSRNO
040504                                          END LCSROUT
040504                                          POP     R1
040506  000207                                  RETURN

                                                .SBTTL  TRAP    INVALIDATE BACKGROUND PATTERN
040510                                  $INVALID:PUSH   R0,R1
040514  013701  002106                        MOV     BANK,R1
040520  070127  000006                        MUL     #6,R1
040524  042761  020000  003020                BIC     #BIT13,CONFIG+2(R1)
040532                                          POP     R1,R0
040536  000002                                  RTI
```

```
 6528 040540                            CHKGEN: SUBTST<<SUBR    GENERATE CHECK BITS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    GENERATE CHECK BITS
                                        ;*****************************************************************************
 6529                                           ;CHECK BIT GENERATOR ROUTINE
 6530                                           ;CALLING SEQUENCE IS:
 6531                                           ;       MOV     #WORD1,SOURCE   ;SOURCE = ADDRESS OF DATA
 6532                                           ;       CALL    CHKGEN
 6533                                           ;
 6534                                           ;CHECK BITS RETURNED IN BITS 14-8 OF LOCATION CHECK
 6535                                           ;
 6536 040540                                   PUSH    R0,R1,R2,R3,R4,R5
 6537 040554  012702  000077                   MOV     #77,R2          ;DEFAULT CHECKBITS FOR DOUBLE WORD OF ZEROS
 6538 040560  012703  040640                   MOV     #CHKTAB,R3      ;ADDRESS OF CHECKBIT TABLE
 6539 040564  013705  002402                   MOV     SOURCE,R5       ;GET SOURCE ADDRESS
 6540 040570  012501                           MOV     (R5)+,R1        ;GET LSB'S
 6541 040572  011500                           MOV     (R5),R0         ;GET MSB'S
 6542
 6543 040574  006704                    1$:    SXT     R4              ;EXTEND SIGN OF DOUBLE WORD TO R4
 6544 040576  142304                           BICB    (R3)+,R4        ;ELIMINATE BITS THAT DON'T COUNT
 6545 040600  074402                           XOR     R4,R2           ;COMPLEMENT MASKED BITS IN CHECKBITS
 6546 040602  073027  000000'                  ASHC    #1,R0           ;DOUBLE PRECISION LEFT SHIFT R0,,R1
 6547 040606  001372                           BNE     1$              ;LOOP TILL ALL BITS ARE CHECKED
 6548
 6549 040610  042702  177600                   BIC     #^C177,R2               ;KILL ALL JUNK BITS
 6550 040614  000302                           SWAB    R2              ;POSITION CHECKBITS IN BITS 14-8
 6551 040616  010237  002404                   MOV     R2,CHECK
 6552 040622                                   POP     R5,R4,R3,R2,R1,R0
 6553 040636  000207                           RETURN
```

```
 6556 040640                            CHKTAB: ;BYTE #3
 6557 040640 200                                .BYTE   ^C177           ;BIT 31
 6558 040641 301                                .BYTE   ^C076           ;BIT 30
 6559 040642 302                                .BYTE   ^C075           ;BIT 29
 6560 040643 203                                .BYTE   ^C174           ;BIT 28
 6561 040644 304                                .BYTE   ^C073           ;BIT 27
 6562 040645 205                                .BYTE   ^C172           ;BIT 26
 6563 040646 206                                .BYTE   ^C171           ;BIT 25
 6564 040647 307                                .BYTE   ^C070           ;BIT 24
 6565                                           ;BYTE #2
 6566 040650 310                                .BYTE   ^C067           ;BIT 23
 6567 040651 211                                .BYTE   ^C166           ;BIT 22
 6568 040652 212                                .BYTE   ^C165           ;BIT 21
 6569 040653 313                                .BYTE   ^C064           ;BIT 20
 6570 040654 214                                .BYTE   ^C163           ;BIT 19
 6571 040655 315                                .BYTE   ^C062           ;BIT 18
 6572 040656 316                                .BYTE   ^C061           ;BIT 17
 6573 040657 217                                .BYTE   ^C160           ;BIT 16
 6574                                           ;BYTE #1
 6575 040660 320                                .BYTE   ^C057           ;BIT 15
 6576 040661 221                                .BYTE   ^C156           ;BIT 14
 6577 040662 222                                .BYTE   ^C155           ;BIT 13
 6578 040663 323                                .BYTE   ^C054           ;BIT 12
 6579 040664 224                                .BYTE   ^C153           ;BIT 11
 6580 040665 325                                .BYTE   ^C052           ;BIT 10
 6581 040666 326                                .BYTE   ^C051           ;BIT  9
 6582 040667 227                                .BYTE   ^C150           ;BIT  8
 6583                                           ;BYTE #0
 6584 040670 340                                .BYTE   ^C037           ;BIT  7
 6585 040671 241                                .BYTE   ^C136           ;BIT  6
 6586 040672 242                                .BYTE   ^C135           ;BIT  5
 6587 040673 343                                .BYTE   ^C034           ;BIT  4
 6588 040674 244                                .BYTE   ^C133           ;BIT  3
 6589 040675 345                                .BYTE   ^C032           ;BIT  2
 6590 040676 346                                .BYTE   ^C031           ;BIT  1
 6591 040677 247                                .BYTE   ^C130           ;BIT  0
```

```
6595 040700                                     SUBTST<<SUBR    MAPPER>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    MAPPER
                                        ;*****************************************************************************
6596                                    ;THIS SUBROUTINE MAPS THE MEMORY BANK (16K WORDS = 1 BANK)
6597                                    ;IN R3 TO THE TEST PATTERN AREA (SUPERVISOR VIRTUAL (60000 - 157777).
6598                                    ;
6599                                    ;CALL   MOV     BANKNO,R3               ;SET UP BANK ARGUEMENT
6600                                    ;       CALL    MAPPER                  ;ACTUAL CALL
6601                                    ;       RETURN                          ;ONLY RETURN
6602
6603                                    ;SET SUPERVISOR UP FOR 1 TO 1 MAP
6604 040700                             MAPPER: PUSH    R0,R1,R2,R4,R5
6605 040712  012700  172340                     MOV     #KIPAR0,R0              ;FIRST AREA TO MAP TO
6606 040716  012701  172240                     MOV     #SIPAR0,R1              ;FIRST ADDRESS REGISTER
6607 040722  012702  077406                     MOV     #77406,R2               ;CONSTANT FOR 4K PAGE, UP, R/W
6608 040726  012704  172200                     MOV     #SIPDR0,R4              ;FIRST DISCRIPTOR REGISTER
6609 040732  012705  000010                     MOV     #8.,R5                  ;COUNTER
6610 040736  012021                     1$:    MOV     (R0)+,(R1)+             ;PUT IN SUPERVISOR ADDRESS
6611 040740  010224                             MOV     R2,(R4)+                ;PUT IN SUPERVISOR DISCRIPTOR
6612 040742  077503                             SOB     R5,1$                   ;LOOP TILL DONE
6613 040744  012741  177600                     MOV     #177600,-(R1)           ;CORRECT LAST FIELD FOR PERIPHERALS PAGE
6614
6615                                    ;SET UP SUPERVISOR FOR TEST AREA
6616 040750  022703  000170                     CMP     #120.,R3                ;MAP NOTHING (1 TO 1)?
6617 040754  001412                             BEQ     3$                      ;YES - SKIP
6618 040756  072327  000011                     ASH     #9.,R3                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
6619                                                                            ;FOR MEMORY MANAGEMENT - 1000
6620 040762  012701  172246                     MOV     #SIPAR3,R1              ;SETUP FOR AUTO INCREMENTING
6621 040766  012702  000004                     MOV     #4,R2                   ;COUNTER
6622 040772  010321                     2$:    MOV     R3,(R1)+                ;PLUG IN PAR INFO
6623 040774  062703  000200                     ADD     #200,R3                 ;BUMP ADDRESS 4K
6624 041000  077204                             SOB     R2,2$                   ;LOOP TILL DONE
6625 041002                             3$:    POP     R5,R4,R2,R1,R0
6626 041014  000207                             RETURN
6627                                            .SBTTL  TRAP    MAP KERNEL (ALMOST 1 TO 1) TRAP HANDLER
6628 041016                             $KMAP: PUSH     R0,R1,R2,R3,R4
6629 041030  005000                             CLR     R0                      ;1ST AREA TO MAP TO
6630 041032  012701  172340                     MOV     #KIPAR0,R1              ;FIRST ADDRESS
6631 041036  012702  077406                     MOV     #77406,R2               ;CONSTANT FOR 4K PAGE,UP,R/W
6632 041042  012703  172300                     MOV     #KIPDR0,R3              ;1ST PAGE DISCRIPTOR REGISTER
6633 041046  012704  000010                     MOV     #8.,R4                  ;COUNTER
6634 041052  010021                     1$     MOV     R0,(R1)+                ;PUT IN KERNEL ADDRESS
6635 041054  010223                             MOV     R2,(R3)+                ;PUT IN KERNEL DISCRIPTOR
6636 041056  062700  000200                     ADD     #200,R0                 ;ADD ADDRESS CONSTANT FOR 4K CHANGE
6637 041062  077405                             SOB     R4,1$                   ;LOOP TILL DONE
6638 041064  012741  177600                     MOV     #177600,-(R1)           ;THE PERIPHERALS PAGE TO KIPAR7
6639 041070  012741  177400                     MOV     #177400,-(R1)           ;AND NEXT LOWER PAGE TO KIPAR6
6640 041074                                     IF CPUBIT NE #MASTER            ;IF I'M NOT THE MASTER
6641 041104  013700  002710                       MOV   LOADHOME,R0             ;MAP TO LOADERS LIKE THE MASTER DID.
6642 041110  004737  042370                       CALL  NEWLOAD
6643 041114                                     END ;OF IF CPUBIT
6644 041114                                     POP     R4,R3,R2,R1,R0
6645 041126  000002                             RTI
```

```
                                        RELOCATE:SUBTST <<RELOCATE PROGRAM>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        RELOCATE PROGRAM
                                        ;*****************************************************************************
                                                IF #SW12 SET.IN @SWR THEN $RETURN ERROR
                                                BEGIN LOADERBANK
                                                  FOR BANK := #1 TO #167
                                                    CALL EXBANK
                                                    IF ACFLAG IS TRUE AND PFLAG IS FALSE AND BMFLAG IS FALSE
                                                      MOV       BANK,R0
                                                      MOV       R0,LOADBANK
                                                      MOV       LOADHOME,R1
                                                      CALL      BANKMOV
                                                      CALL      NEWLOAD         ;MAP NEW LOADER BANK IN KERNEL
                                                      MOV       BANKINDEX,R1
                                                      BIS       #BIT15,CONFIG+2(R1)     ;MARK LOADER
                                                      BIC       #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
                                                      LEAVE LOADERBANK
                                                    END ;OF IF ACFLAG
                                                  END ;OF FOR BANK
                                                  IF #SW13 OFF.IN @SWR
                                                    TYPE        MSG075          ;RELOCATION NOT POSSIBLE
                                                  END ;OF IF #SW13
                                                  $RETURN ERROR
                                                END LOADERBANK
                                                BEGIN FINDBANK
                                                  FOR R1 :  #3*2 TO #167*3*2 BY #6
                                                    IF #BIT11!BIT15 OFF.IN CONFIG(R1) ;IF NO ERRORS & NOT PROGRAM SPACE
                                                      IF #BIT15 OFF.IN CONFIG+2(R1) ;IF NOT LOADER BANK
                                                        IF CPUBIT SET.IN CONFIG(R1) ;IF ACCESSABLE
                                                          IF #BIT13!BIT14 OFF.IN CONFIG(R1) THEN LEAVE FINDBANK ;IF MU11
                                                          IF #BIT13 SET.IN CONFIG(R1) AND #BIT14 OFF.IN CONFIG(R1) ;IF MK11
                                                            IF #BIT12 SET.IN CONFIG-6(R1) AND #BIT12 OFF.IN CONFIG(R1)
                                                              ;IF 1ST UNPROTECTED MK11 BANK
                                                              LEAVE FINDBANK
                                                            END ;OF IF #BIT12
                                                          END ;OF IF #BIT13
                                                        END ;OF IF CPUBIT
                                                      END ;OF IF #BIT15
                                                    END ;OF IF #BIT11
                                                  END ;OF FOR
                                                  IF #SW13 OFF.IN @SWR
                                                    TYPE        MSG075          ;RELOCATION NOT POSSIBLE
                                                  END ;OF IF #SW13
                                                  $RETURN ERROR
                                                END FINDBANK
6692 041442  042761  020000  003020            BIC     #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
6693 041450  005000                            CLR     R0
6694 041452  071027  000006                    DIV     #6,R0
```

RELOCATE PROGRAM SEQ 0398

```
6697 041456                                  RELOC1: LET NEWBANK := R0
6698 041462  004737  042240                          CALL    USERMAP          ;MAP NEWBANK TO USER PAR
6699 041466                                          USER                     ;ENTER USER MODE
6700 041474                                          BMOV    0,100000,SIZE    ;MOVE PROGRAM
6701 041506  104417                                  KERNEL                   ;ENTER KERNEL MODE
6702 041510  042737  000040  172516                  BIC     #BIT5,MMR3       ;TURN OFF UNIBUS MAP
6703 041516  013700  002400                          MOV     NEWBANK,R0
6704 041522  006200                                  ASR     R0
6705 041524                                          ON.ERROR
6706 041526  012737  100000  170200                    MOV   #BIT15,MAPL0
6707 041534                                          END ;OF ON.ERROR
6708 041534  010037  170202                          MOV     R0,MAPH0
6709 041540  004737  042026                          CALL    LOWMAP           ;SETUP LOWER 16K IN UNIBUS MAP
6710 041544  052737  000040  172516                  BIS     #BIT5,MMR3       ;ENERGIZE UNIBUS MAP
6711 041552  042737  001001  177572                  BIC     #BIT9!BIT0,MMR0  ;DEENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6712 041560  004737  042322                          CALL    NEWKERNEL
6713 041564  052737  001001  177572                  BIS     #BIT9.BIT0,MMR0  ;ENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6714 041572                                          SET     RLFLAG
6715 041600                                          $RETURN NOERROR
```

```
6718 041604                             UNRELOCATE:SUBTST       <<UNRELOCATE PROGRAM>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       UNRELOCATE PROGRAM
                                        ;*****************************************************************************
6719                                            ;RESTORE LOADERS
6720 041604                                     PUSH    R0
6721 041606  013701  002532                     MOV     LOADBANK,R1
6722 041612  013700  002710                     MOV     LOADHOME,R0
6723 041616  004737  042072                     CALL    BANKMOV
6724 041622  004737  042370                     CALL    NEWLOAD                 ;MAP NEW LOADER BANK IN KERNEL SPACE
6725 041626                                     PUSH    BANK
6726 041632  013737  002532  002106            MOV     LOADBANK,BANK
6727 041640  004737  042422                     CALL    EXBANK
6728 041644  013701  002110                     MOV     BANKINDEX,R1
6729 041650  042761  100000  003020            BIC     #BIT15,CONFIG+2(R1)     ;CLEAR LOADER FLAG
6730 041656  013737  002710  002106            MOV     LOADHOME,BANK
6731 041664  004737  042422                     CALL    EXBANK
6732 041670  013701  002110                     MOV     BANKINDEX,R1
6733 041674  042761  020000  003020            BIC     #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
6734 041702                                     POP     BANK
6735
6736                                            ;RESTORE BANK 0
6737 041706  042737  020000  003020            BIC     #BIT13,CONFIG+2         ;INVALIDATE BACKGROUND PATTERN
6738 041714                                     LET NEWBANK := #0
6739 041720  004737  042240                     CALL    USERMAP                 ;MAP NEWBANK TO USER PAR
6740 041724                                     USER                            ;ENTER USER MODE
6741 041732                                     BMOV    0,100000,SIZE           ;MOVE PROGRAM
6742 041744  104417                             KERNEL                          ;ENTER KERNEL MODE
6743 041746  042737  001001  177572            BIC     #BIT9!BIT0,MMR0         ;DEENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6744 041754  004737  042322                     CALL    NEWKERNEL
6745 041760  052737  001001  177572            BIS     #BIT9!BIT0,MMR0         ;ENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6746 041766  005037  002134                     CLR     RLFLAG
6747 041772  042737  000040  172516            BIC     #BIT5,MMR3              ;TURN OFF UNIBUS MAP
6748 042000                                     CLEAR   MAPL0,MAPH0
6749 042010  004737  042026                     CALL    LOWMAP                  ;SETUP LOWER 16K OF UNIBUS MAP
6750 042014  052737  000040  172516            BIS     #BIT5,MMR3              ;ENERGIZE UNIBUS MAP
6751 042022                                     POP     R0
6752 042024  000207                             RETURN
6753
6754 042026                             LOWMAP: SUBTST  <<SETUP LOWER 16K OF UNIBUS MAP>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SETUP LOWER 16K OF UNIBUS MAP
                                        ;*****************************************************************************
6755 042026                                     PUSH    R0,R1,R2
6756 042034  012700  170200                     MOV     #MAPL0,R0
6757 042040  012701  170204                     MOV     #MAPL1,R1
6758 042044  012702  000003                     MOV     #3,R2
6759 042050  012011                     1$:     MOV     (R0)+,(R1)
6760 042052  062721  020000                     ADD     #BIT13,(R1)+
6761 042056  012021                             MOV     (R0)+,(R1)+
6762 042060  077205                             SOB     R2,1$
6763 042062                                     POP     R2,R1,R0
6764 042070  000207                             RETURN
```

```
 6767 042072                            BANKMOV:SUBTST  <<MOVE BANKS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MOVE BANKS
                                        ;*****************************************************************************
 6768                                           ;MOVE 3/4 OF A BANK
 6769                                           ;CALLING SEQUENCE
 6770                                           ;R0 = DESTINATION BANK
 6771                                           ;R1 = SOURCE BANK
 6772 042072  104415                            SAVREG
 6773 042074  004737  042240                    CALL    USERMAP
 6774 042100  104416                            RESREG
 6775 042102  104415                            SAVREG
 6776 042104  072027  000011                    ASH     #9.,R0
 6777 042110  072127  000011                    ASH     #9.,R1
 6778 042114  012702  177650                    MOV     #UIPAR4,R2
 6779 042120  012703  000200                    MOV     #200,R3
 6780
 6781 042124  010122                            MOV     R1,(R2)+                ;MAP 1ST HALF BANK
 6782 042126  060301                            ADD     R3,R1                   ;BUMP BY 4K
 6783 042130  010122                            MOV     R1,(R2)+
 6784 042132  060301                            ADD     R3,R1
 6785
 6786 042134  010022                            MOV     R0,(R2)+
 6787 042136  060300                            ADD     R3,R0
 6788 042140  010022                            MOV     R0,(R2)+
 6789 042142  060300                            ADD     R3,R0
 6790
 6791 042144                                    USER
 6792 042152                                    BMOV    100000,140000,SIZE/2    ;MOV 1ST HALF BANK
 6793 042164  104417                            KERNEL                  ;ENTER KERNEL MODE
 6794
 6795 042166  012702  177650                    MOV     #UIPAR4,R2
 6796
 6797 042172  010122                            MOV     R1,(R2)+                ;MAP 2ND HALF BANK
 6798 042174  060301                            ADD     R3,R1                   ;BUMP BY 4K
 6799 042176  010122                            MOV     R1,(R2)+
 6800 042200  060301                            ADD     R3,R1
 6801
 6802 042202  010022                            MOV     R0,(R2)+
 6803 042204  060300                            ADD     R3,R0
 6804 042206  010022                            MOV     R0,(R2)+
 6805 042210  060300                            ADD     R3,R0
 6806
 6807 042212                                    USER
 6808 042220                                    BMOV    100000,140000,SIZE/4    ;MOV 3ND FOURTH OF BANK
 6809 042232  104417                            KERNEL                  ;ENTER KERNEL MODE
 6810
 6811 042234  104416                            RESREG
 6812 042236  000207                            RETURN
```

```
 6815 042240                            USERMAP:SUBTST  <<SUBR  MAP USER TO NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    MAP USER TO NEW BANK
                                        ;*****************************************************************************
 6816 042240  012701  177640                    MOV     #UIPAR0,R1              ;COPY KERNEL PAR'S & PDR'S (0-3)
 6817 042244  012702  172340                    MOV     #KIPAR0,R2
 6818 042250  012703  177600                    MOV     #UIPDR0,R3
 6819 042254  012704  172300                    MOV     #KIPDR0,R4
 6820 042260  012705  000004                    MOV     #4,R5
 6821 042264  012221            1$:             MOV     (R2)+,(R1)+
 6822 042266  011423                            MOV     (R4),(R3)+
 6823 042270  077503                            SOB     R5,1$
 6824
 6825 042272  013700  002400                    MOV     NEWBANK,R0
 6826 042276  072027  000011                    ASH     #9.,R0                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
 6827                                                                           ;FOR MEMORY MANAGEMENT = 1000
 6828 042302  012705  000004                    MOV     #4,R5
 6829 042306  010021            2$:             MOV     R0,(R1)+                ;SETUP UIPAR(4-7)
 6830 042310  062700  000200                    ADD     #200,R0                 ;BUMP ADDRESS 4K
 6831 042314  011423                            MOV     (R4),(R3)+              ;SETUP UIPDR(4-7)
 6832 042316  077505                            SOB     R5,2$
 6833 042320  000207                            RETURN
 6834
 6835 042322                            NEWKERNEL:SUBTST        <<SUBR  SETUP KERNEL PAR'S FOR NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    SETUP KERNEL PAR'S FOR NEW BANK
                                        ;*****************************************************************************
 6836 042322                                    PUSH    R0,R1,R5
 6837 042330  012700  172340                    MOV     #KIPAR0,R0
 6838 042334  013701  002400                    MOV     NEWBANK,R1
 6839 042340  072127  000011                    ASH     #9.,R1                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
 6840                                                                           ;FOR MEMORY MANAGEMENT = 1000
 6841 042344  012705  000004                    MOV     #4,R5
 6842 042350  010120            1$.             MOV     R1,(R0)+                ;SETUP KIPAR(0-3)
 6843 042352  062701  000200                    ADD     #200,R1
 6844 042356  077504                            SOB     R5,1$
 6845 042360                                    POP     R5,R1,R0
 6846 042366  000207                            RETURN
 6847
 6848 042370                            NEWLOAD:SUBTST  <<SUBR  SETUP KERNEL PAR'S FOR NEW LOADER BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    SETUP KERNEL PAR'S FOR NEW LOADER BANK
                                        ;*****************************************************************************
 6849                                           ;R0 CONTAINS THE DESTINATION BANK
 6850 042370                                    PUSH    R0,R1
 6851 042374  012701  172350                    MOV     #KIPAR4,R1
 6852 042400  072027  000011                    ASH     #9.,R0                  ;BANK 1 STARTS AT 1000000 LESS 6 LSB'S (1000)
 6853 042404  010021                            MOV     R0,(R1)+                ;SETUP KIPAR4
 6854 042406  062700  000200                    ADD     #200,R0
 6855 042412  010021                            MOV     R0,(R1)+                ;SETUP KIPAR5
 6856 042414                                    POP     R1,R0
 6857 042420  000207                            RETURN
```

```
                                EXBANK: SUBTST  <<SUBR  EXAMINE BANK>>
                                ;*****************************************************************
                                ;*SUBTEST        SUBR    EXAMINE BANK
                                ;*****************************************************************
                                ;DOES THE FOLLOWING:
                                ;(1) SETS UP 'BANKINDEX'' AND R0 BASED ON VALUE OF 'BANK''
                                ;(2) SETS THE 'MKFLAG'' IF THE BANK IS AN MK11
                                ;(3) SETS THE 'KPFLAG'' IF THE BANK IS THE PROTECTED REGION OF MK11 MEMORY
                                ;(4) SETS THE 'ACFLAG'' IF THE BANK CAN BE ACCESSED BY THIS CPU
                                ;(5) SETS THE 'PFLAG'' IF THE BANK IS IN PROGRAM SPACE
                                ;(6) SETS THE 'RRFLAG'' IF RELOCATION IS REQUIRED TO TEST THIS BANK
                                ;    HOWEVER, IT COMPLEMENTS THIS FLAG IF THE RELOCATION FLAG 'RLFLAG'' IS SET
                                ;    (THIS IS NECESSARY FOR THE USE OF THE RECURSIVE 'MODE'' SUBROUTINES)
                                ;    BUT! THE 'RRFLAG'' IS ALWAYS SET TO DISABLE TESTING IF FIELD SERVICE MODE
                                ;      ''SELECTED BANKS'' ARE BEING TESTED AND THIS BANK IS NOT SELECTED.
                                ;(7) SETS THE 'BMFLAG'' IF THE BANK IS A BAD MEMORY
                                ;    HOWEVER, IT COMPLEMENTS THIS FLAG IF THE 'WORST'' FLAG IS NOT SET
                                ;    (THIS IS NECESSARY FOR THE USE OF THE RECURSIVE 'MODE'' SUBROUTINES)
042422                              PUSH    R0,R1,R2
042430                              CLEAR   MKFLAG,KPFLAG
042440                              SET     ACFLAG
042446                              CLEAR   PFLAG,RRFLAG,BMFLAG
042462  013701  002106              MOV     BANK,R1
042466  070127  000006              MUL     #6,R1                   ;R0 - BANK * 6
042472  010137  002110              MOV     R1,BANKINDEX
042476  032761  010000  003016      BIT     #BIT12,CONFIG(R1)       ;PROTECTED REGION OF MK11 MEMORY?
042504  001406                      BEQ     1$                      ;NO - SKIP
042506                              SET     KPFLAG,RRFLAG
042522  012700  000020          1$: MOV     #MASTER,R0
042526                              FOR R2 := #0 TO SLAVES
042530                                IF R0 SET.IN CPUBIT AND R0 OFF.IN CONFIG(R1)
042544  005037  002124                    CLR ACFLAG
042550                                END ;OF IF R0
042550  006300                        ASL   R0
042552                              END ;OF FOR R2
042562  016100  003016          2$: MOV     CONFIG(R1),R0
042566  042700  117777              BIC     #^C60000,R0             ;GET MEMORY TYPE BITS
042572  022700  020000              CMP     #20000,R0               ;IS IT AN MK11?
042576  001003                      BNE     3$                      ;NO - SKIP
042600                              SET     MKFLAG
042606  032761  100000  003016  3$: BIT     #BIT15,CONFIG(R1)       ;BANK = PROGRAM SPACE?
042614  001406                      BEQ     5$                      ;NO - SKIP
042616                              SET     PFLAG,RRFLAG
042632  005737  002134          5$: TST     RLFLAG                  ;IS PROGRAM RELOCATED?
042636  001402                      BEQ     6$                      ;NO - SKIP
042640  005137  002132              COM     RRFLAG                  ;YES - COMPLEMENT RELOCATION REQUIRED FLAG
042644  032761  004000  003016  6$: BIT     #BIT11,CONFIG(R1)       ;ERRORS PRESENT IN THIS BANK?
042652  001403                      BEQ     8$                      ;NO - SKIP
042654                              SET     BMFLAG
042662  005737  002712          8$: TST     WORST                   ;IS THIS A WORST FIRST PASS?
042666  001002                      BNE     9$                      ;YES - SKIP
042670  005137  002136              COM     BMFLAG                  ;NO - COMPLEMENT BAD MEMORY FLAG
042674                          9$: IF SELONLY IS TRUE AND #BIT14 OFF.IN CONFIG+2(R1)
042712                                SET   RRFLAG
042720                              END ;OF IF SELONLY
042720                              POP     R2,R1,R0
042726  000207                      RETURN
```

```
                                BANKOK: SUBTST  <<SUBR  BANK OK?>>
                                ;*********************************************************************
                                ;*SUBTEST        SUBR    BANK OK?
                                ;*********************************************************************
                                        ;TEST TO INSURE THAT THE TYPE OF MEMORY IN THE PRESENT BANK
                                        ;IS OF THE TYPE WE ARE TESTING 'TMFLAG'.
                                        ;RESULT IS RETURNED IN THE CONDITION CODES (OK = (=0)).
042730  013700  002140                  MOV     TMFLAG,R0
042734  005100                          COM     R0
042736  013701  002126                  MOV     MKFLAG,R1
042742  074001                          XOR     R0,R1
042744  000207                          RETURN                          ;OK - (=OK)

042746                          INCRPT:
042746                          INCPAT: SUBTST  <<SUBR  INCREMENT PATTERN TESTING MK11'S>>
                                ;*********************************************************************
                                ;*SUBTEST        SUBR    INCREMENT PATTERN TESTING MK11'S
                                ;*********************************************************************
                                        ;INCREMEMT THE PATTERN & SET UP THE CONDITION CODES
                                        ;RESULT - Z BIT SET INDICATES OVERFLOW
042746  005237  002120                  INC     PATTERN
042752  022737  000040  002120          CMP     #40,PATTERN             ;SET UP CONDITION CODES
042760  000207                          RETURN                          ;NOT EQUAL TO ZERO IS GOOD (NO OVERFLOW)

042762                          SETPAT:
042762                          HIPAT:  SUBTST  <<SUBR  SET HIGHEST PATTERN TESTING TYPE>>
                                ;*********************************************************************
                                ;*SUBTEST        SUBR    SET HIGHEST PATTERN TESTING TYPE
                                ;*********************************************************************
042762  012737  000037  002120          MOV     #37,PATTERN             ;SET HIGHEST PATTERN
042770  000207                          RETURN

042772                          INCBNK: SUBTST  <<SUBR  INCREMENT BANK & TEST>>
                                ;*********************************************************************
                                ;*SUBTEST        SUBR    INCREMENT BANK & TEST
                                ;*********************************************************************
                                        ;RESULTS RETURNED IN CONDITION CODES
042772  005237  002106                  INC     BANK
042776  022737  000170  002106          CMP     #120.,BANK              ;TOO FAR?
043004  000207                          RETURN
```

```
 6948 043006                            INCMAR: SUBTST  <<SUBR  INCREMENT MARGINS & TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    INCREMENT MARGINS & TEST
                                        ;*****************************************************************************
 6949                                           ;SKIPS THE SPECIAL CASE (MARGIN CANNOT = 1)
 6950                                           ;RETURNS THE RESULT OF MARGIN OVERFLOW IN THE CONDITION CODES
 6951                                           .ENABL  LSB
 6952 043006                                    IF #SW11 OFF.IN @SWR AND QVFLAG IS FALSE
 6953 043024                                      GOTO 1$
 6954 043026                                    END ;OF IF #SW11
 6955 043026  013737  002112  002376            MOV     MARGIN,OLDMARGIN
 6956 043034  005037  002112                    CLR     MARGIN                  ;YES - SET MARGIN TO ZERO
 6957 043040  004737  043300                    CALL    COREHISTORY
 6958 043044  000435                           BR      3$
 6959 043046  013737  002112  002376  1$:      MOV     MARGIN,OLDMARGIN
 6960 043054  005237  002112                    INC     MARGIN
 6961 043060  022737  000001  002112            CMP     #1,MARGIN               ;SPECIAL CASE?
 6962 043066  001002                           BNE     2$                      ;NO - SKIP
 6963 043070  005237  002112                    INC     MARGIN                  ;YES - SET MARGIN TO "2"
 6964 043074                            2$:     IF MKFLAG IS FALSE AND MARGIN NE #6
 6965 043112                                      GOTO 3$
 6966 043114                                    END ;OF IF MKFLAG
 6967 043114                                    IF MKFLAG IS TRUE AND MARGIN NE #4
 6968 043132                                      GOTO 3$
 6969 043134                                    END ;OF IF MKFLAG
 6970 043134  005037  002112                    CLR     MARGIN                  ;YES - SET MARGIN TO ZERO
 6971 043140  004737  043300            3$:     CALL    COREHISTORY
 6972 043144  005737  002112                    TST     MARGIN                  ;SET CONDITION CODE - DONE IF Z BIT SET
 6973 043150  000207                           RETURN
 6974                                           .DSABL  LSB
 6975
 6976 043152                            DECMAR: SUBTST  <<DECREMENT MARGINS & TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        DECREMENT MARGINS & TEST
                                        ;*****************************************************************************
 6977                                           ;SKIPS THE SPECIAL CASE (MARGIN CANNOT = 1)
 6978                                           ;RETURNS THE RESULT OF MARGIN UNDERFLOW IN THE CONDITION CODES
 6979 043152  013737  002112  002376            MOV     MARGIN,OLDMARGIN
 6980 043160  005337  002112                    DEC     MARGIN
 6981 043164  022737  000001  002112            CMP     #1,MARGIN               ;SPECIAL CASE?
 6982 043172  001002                           BNE     1$                      ;NO - SKIP
 6983 043174  005337  002112                    DEC     MARGIN                  ;YES - SET MARGIN TO "0"
 6984 043200  004737  043300            1$:     CALL    COREHISTORY
 6985 043204  005737  002112                    TST     MARGIN                  ;SETUP CONDITION CODES - NEGATIVE IS UNDERFLOW
 6986 043210  000207                           RETURN
```

```
6989 043212                                 SETMAR: SUBTST  <<SUBR  SET HIGHEST MARGIN>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        SUBR    SET HIGHEST MARGIN
                                            ;*****************************************************************************
6990                                                ;RECOGNIZES THE ''INHIBIT MARGINS SWITCH''
6991                                                .ENABL  LSB
6992 043212                                         IF #SW11 SET.IN @SWR OR QVFLAG IS TRUE
6993 043230                                           GOTO 1$
6994 043232                                         END ;OF IF #SW11
6995 043232  013737  002112  002376                 MOV     MARGIN,OLDMARGIN
6996 043240                                         IF MKFLAG IS FALSE
6997 043246  012737  000005  002112                   MOV   #5,MARGIN               ;HIGHEST MJ11 MARGIN
6998 043254                                         ELSE
6999 043256  012737  000003  002112                   MOV   #3,MARGIN               ;HIGHEST MK11 MARGIN
7000 043264                                         END ;OF IF MKFLAG
7001 043264  004737  043300                         CALL    COREHISTORY
7002 043270  000402                                 BR      2$                      ;SKIP
7003 043272  005037  002112           1$:          CLR     MARGIN                  ;SET MARGIN TO '0''
7004 043276  000207                 2$:          RETURN
7005                                                .DSABL  LSB
7006 043300                                 COREHISTORY:SUBTST      <<SUBR  REWRITE CORE HISTORY>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        SUBR    REWRITE CORE HISTORY
                                            ;*****************************************************************************
7007 043300                                         IF MKFLAG IS FALSE AND NULLFLAG IS FALSE
7008 043314                                           IF OLDMARGIN NE MARGIN
7009 043324                                             IF OLDMARGIN EQ #4 OR OLDMARGIN EQ #5 OR MARGIN EQ #4 OR MARGIN EQ #5
7010 043364  013700  002112                               MOV     MARGIN,R0
7011 043370  006300                                       ASL     R0
7012 043372  010037  177750                               MOV     R0,MAINT              ;SET MARGINS
7013
7014 043376                                               LET R2 -- ONES
7015 043402  004737  035344                               CALL    BACKGND
7016 043406  104511                                       INVALIDATE
7017 043410                                             END ;OF IF
7018 043410                                           END ;OF IF
7019 043410                                         END ;OF IF
7020 043410  005037  002436                         CLR     NULLFLAG
7021 043414  000207                                 RETURN
```

```
043416                              BOOT:   SUBTST  <<BOOTSTRAP ROUTINE>>
                                    ;*******************************************************************
                                    ;*SUBTEST       BOOTSTRAP ROUTINE
                                    ;*******************************************************************
                                            ;INITIALIZE ALL CSR'S
                                            ;CLEAR ANY MARGINS
                                            ;UNRELOCATE IF NECESSARY
                                            ;FLUSH OUT ANY DBE'S
                                            ;TURN OFF MEMORY MANAGEMENT
                                            ;TURN OFF THE UNIBUS MAP
                                            ;BOOT RK0 OR RK1
043416  104472                              ECCINIT                 ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
043420                                      SET4    #BOOT1                  ;TRAPS TO 4 GOTO BOOT1
043426  005037  177750                      CLR     MAINT
043432                                      IF RLFLAG IS TRUE THEN $CALL UNRELOCATE
043444  004737  024754                      CALL    MT0030                  ;FLUSH OUT DBE'S
043450  104421                              DEENERGIZE                      ;TURN OFF MEMORY MANAGEMENT
043452  042737  000040  172516              BIC     #BIT5,MMR3                              ;TURN OFF THE UNIBUS MAP
043460  005001                      BOOT1:  CLR     R1
043462  000005                      1$:     RESET
043464  012700  177406                      MOV     #177406,R0
043470  010160  000004                      MOV     R1,4(R0)
043474  012710  177400                      MOV     #177400,(R0)
043500  012740  000005                      MOV     #5,-(R0)
043504  105710                      2$:     TSTB    (R0)
043506  100376                              BPL     2$
043510  062701  020000                      ADD     #BIT13,R1
043514  005710                              TST     (R0)
043516  100761                              BMI     1$
043520  005007                              CLR     PC
```

```
 7053 043522                            EXIT:   SUBTST  <<HALT PROGRAM>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       HALT PROGRAM
                                        ;*****************************************************************************
 7054 043522  004737  043554                    CALL    SHUTUP
 7055 043526                            EXIT2:  IF APTFLAG IS TRUE OR ACTFLAG IS TRUE
 7056 043542  000777                              BR      .
 7057 043544                                    ELSE
 7058 043546  000000                    $EXHALT:  HALT
 7059 043550  000137  004352                      JMP     START
 7060 043554                                    END ;OF IF APTFLAG
 7061
 7062 043554                            SHUTUP: SUBTST  <<SHUTDOWN DIAGNOSTIC>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SHUTDOWN DIAGNOSTIC
                                        ;*****************************************************************************
 7063                                           ;INITIALIZE ALL CSR'S
 7064                                           ;CLEAR MARGINS
 7065                                           ;UNRELOCATE
 7066                                           ;FLUSH OUT DBE'S
 7067                                           ;RESTORE LOADERS
 7068                                           ;TURN OFF MEMORY MANAGEMENT
 7069                                           ;UNMAP THE UNIBUS MAP
 7070                                           ;CLEAR MULTIPROCESSING LOCK
 7071 043554  104472                           ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
 7072 043556  005037  177750                    CLR     MAINT
 7073 043562                                    IF RLFLAG IS TRUE THEN $CALL UNRELOCATE
 7074 043574                                    IF QUICK IS FALSE
 7075 043602  004737  024754                      CALL  MT0030          ;FLUSH OUT DBE'S
 7076 043606                                    END ;OF IF QUICK
 7077 043606  012700  000001                    MOV     #1,R0           ;DESTINATION BANK
 7078 043612  013701  002710                    MOV     LOADHOME,R1     ;SOURCE BANK
 7079 043616  004737  042072                    CALL    BANKMOV
 7080 043622  104421                           DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT
 7081 043624  042737  000040  172516           BIC     #BIT5,MMR3              ;TURN OFF UNIBUS MAP
 7082 043632  005037  002670                    CLR     LOCK
 7083 043636  000207                           RETURN
 7084
 7085 043640                            APTDOWN:SUBTST  <<APT SHUTDOWN SEQUENCE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       APT SHUTDOWN SEQUENCE
                                        ;*****************************************************************************
 7086 043640                                    MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #
 7087 043654                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
 7088 043662  012737  043640  060024           MOV     #APTDOWN,FIRST+24
 7089 043670  012737  000340  060026           MOV     #340,FIRST+26
 7090 043676  012737  000000  123640           MOV     #0,FIRST+APTDOWN
 7091 043704  104417                           KERNEL                  ;ENTER KERNEL MODE
 7092 043706  000000                    APTHLT: HALT
```

```
7095 043710                                     SUBTST  <<BLOCK MOVE SUBROUTINE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       BLOCK MOVE SUBROUTINE
                                        ;*****************************************************************************
7096                                    ;BLOCK3 HAS 3 ARGUEMENTS
7097                                    ;BLOCK2 HAS 2 ARGUEMENTS
7098                                    ;BLOCK1 HAS 1 ARGUEMENTS
7099                                    ;
7100                                    ;ALL ARE CALLED BY THE BMOV MACRO
7101                                    .ENABL  LSB
7102 043710                            BLOCK1: PUSH    R0,R1,R2
7103 043716  012702  177640                    MOV     #FASTCITY,R2
7104 043722  012701  000020                    MOV     #16.,R1
7105 043726  000413                            BR      3$
7106
7107 043730                            BLOCK2: PUSH    R0,R1,R2
7108 043736  012701  000020                    MOV     #16.,R1
7109 043742  000404                            BR      2$
7110
7111 043744                            BLOCK3: PUSH    R0,R1,R2
7112 043752  012501                            MOV     (R5)+,R1
7113 043754  012502                    2$:     MOV     (R5)+,R2
7114 043756  012500                    3$:     MOV     (R5)+,R0
7115
7116 043760  012022                    1$:     MOV     (R0)+,(R2)+
7117 043762  077102                            SOB     R1,1$
7118 043764                                     POP     R2,R1,R0
7119 043772  000205                            RTS     R5
7120                                            .DSABL  LSB
```

```
                                        .SBTTL  FIELD SERVICE MODE

                                FIELDSERVICE:SUBTST     <<SUBR  FIELD SERVICE COMMAND MODE>>
                                ;*********************************************************************
                                ;*SUBTEST        SUBR    FIELD SERVICE COMMAND MODE
                                ;*********************************************************************
043774  104415                          SAVREG
043776                                  TYPE    MSG020          ;FIELD SERVICE COMMAND MODE
                                
044002                                  IF RLFLAG IS TRUE OR NOFSMODE IS TRUE
044016                                    TYPE  MSG048          ;NOT AVAILABLE NOW - TRY LATER
044022  104416                            RESREG
044024  000207                            RETURN
044026                                  END ;OF IF RLFLAG
044026                                  PUSH    CONTRL,CSRNO,KAMIKAZE   ;SAVE CACHE STATUS
044042  104424                          CACHOFF                 ;TURN CACHE OFF
044044                                  SET     KAMIKAZE
044052                          FS1:    TYPE    MSG026          ;COMMAND:
044056  104414                          RDDEC                   ;READ A DECIMAL NUMBER
044060                                  POP     R0              ;COMMAND --> R0
044062  020027  000024                  CMP     R0,#20.
044066  101403                          BLOS    1$
044070                                  TYPE    MSG021
044074  000766                          BR      FS1
044076                          1$:     CASE R0
044106  044170                            FSCMD0                ;EXIT FIELD SERVICE COMMANDS
044110  044256                            FSCMD1                ;READ CSR
044112  044346                            FSCMD2                ;LOAD CSR
044114  044520                            FSCMD3                ;EXAMINE MEMORY
044116  044764                            FSCMD4                ;MODIFY MEMORY
044120  045274                            FSCMD5                ;SELECT BANK,MARGIN, & PATTERN
044122  046152                            FSCMD6                ;TYPE CONFIGURATION MAP
044124  046160                            FSCMD7                ;BATTERY BACKUP - P/F TEST
044126  046510                            FSCMD8                ;SOB-A-LONG TEST
044130  047104                            FSCMD9                ;SUPER TIGHT SCOPE LOOP
044132  047550                            FCMD10                ;ERROR SUMMARY
044134  047734                            FCMD11                ;REFRESH TEST
044136  050330                            FCMD12                ;SET FILL COUNT
044140  050356                            FCMD13                ;ENTER KAMIKAZE MODE
044142  050400                            FCMD14                ;EXIT KAMIKAZE MODE
044144  050420                            FCMD15                ;TURN CACHE OFF
044146  050436                            FCMD16                ;TURN CACHE ON
044150  050454                            FCMD17                ;RUN ONLY MULTIPORT TESTS
044152  050470                            FCMD18                ;RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS
044154  050502                            FCMD19                ;TEST ONLY SELECTED BANKS
044156  050566                            FCMD20                ;RESUME TESTING ALL BANKS
044160                                  END ;OF CASE
044166  000731                          BR      FS1
```

```
7169 044170                          FSCMD0: SUBTST  <<COMMAND 0     EXIT>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        COMMAND 0       EXIT
                                     ;*****************************************************************************
7170 044170                                  TYPE    MSG103          ;LEAVING FIELD SERVICE MODE
7171 044174  062706  000002                  ADD     #2,SP
7172 044200                                  IF SKIPKAMI IS TRUE
7173 044206  062706  000002                    ADD   #2,SP                   ;THROW AWAY OLD KAMIKAZE FLAG
7174 044212  005037  002012                    CLR   SKIPKAMI
7175 044216                                  ELSE
7176 044220                                    POP   KAMIKAZE              ;RESTORE OLD KAMIKAZE FLAG
7177 044224                                  END ;OF IF SKIPKAMI
7178 044224                                  POP     CSRNO
7179 044230                                  IF CACHK EQ #BIT0.BIT2.BIT3.BIT8!BIT9          ;IF CACHE IS OFF
7180 044240  062706  000002                    ADD   #2,SP                   ;THROW AWAY CACHE STATUS
7181 044244                                  ELSE
7182 044246                                    POP   CONTRL                ;RESTORE CACHE STATUS
7183 044252                                  END ;OF IF CACHK
7184 044252  104416                          RESREG
7185 044254  000207                          RETURN
7186
7187 044256                          FSCMD1: SUBTST  <<FS    COMMAND 1       READ CSR>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        FS      COMMAND 1       READ CSR
                                     ;*****************************************************************************
7188 044256  004737  050630                  CALL    WHICHCSR
7189 044262  010637  002374                  MOV     SP,FSSTACK
7190 044266                                  SET4    #1$             ;TRAPS TO 4 GOTO 1$
7191 044274  104426                          READCSR
7192 044276                                  SET     NOERROR
7193 044304  104026                          ERROR   +26             ;USE ERROR ROUTINE FOR PRINTOUT
7194 044306                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
7195 044320  000207                          RETURN
7196 044322                          1$:     TYPE    MSG025          ;THIS CSR DOES NOT EXIST
7197 044326  013706  002374                  MOV     FSSTACK,SP
7198 044332                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
7199 044344  000207                          RETURN
```

```
7202 044346                          FSCMD2: SUBTST  <<FS    COMMAND 2       LOAD CSR>>
                                     ;*********************************************************************
                                     ;*SUBTEST       FS      COMMAND 2       LOAD CSR
                                     ;*********************************************************************
7203 044346  004737  050630                  CALL    WHICHCSR
7204 044352  010637  002374                  MOV     SP,FSSTACK
7205 044356                                  SET4    #1$             ;TRAPS TO 4 GOTO 1$
7206 044364  104426                          READCSR
7207 044366                                  TYPE    MSG027
7208 044372                                  SET     NOERROR
7209 044400  104026                          ERROR   +26             ;USE ERROR ROUTINE FOR PRINTOUT
7210 044402                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
7211 044414                                  TYPE    MSG023          ;FIRST CSR WORD
7212 044420  104413                          RDOCT                   ;READ AN OCTAL NUMBER
7213 044422                                  POP     CSR             ;PUT IN IN LOC ''CSR''
7214 044426                                  TYPE    MSG024          ;2ND CSR WORD
7215 044432  104413                          RDOCT                   ;READ AN OCTAL NUMBER
7216 044434                                  POP     CSR+2           ;PUT IN IN LOC ''CSR+2''
7217 044440                                  SET     TWOCSRS
7218 044446  104425                          LOADCSR
7219 044450  00503?  002600                  CLR     TWOCSRS
7220 044454  104426                          READCSR
7221 044456                                  TYPE    MSG028
7222 044462                                  SET     NOERROR
7223 044470  104026                          ERROR   +26             ;USE FOR PRINTOUT - NOT AN ERROR
7224 044472  000207                          RETURN
7225 044474                          1$:     TYPE    MSG025          ;THIS CSR DOES NOT EXIST
7226 044500  013706  002374                  MOV     FSSTACK,SP
7227 044504                                  RES4                    ;RESET TRAPS TO 4 TO DEFAULT
7228 044516  000207                          RETURN
```

```
7231 044520                                FSCMD3: SUBTST  <<FS     COMMAND 3       EXAMINE MEMORY>>
                                           ;*********************************************************************
                                           ;*SUBTEST       FS       COMMAND 3       EXAMINE MEMORY
                                           ;*********************************************************************
7232 044520                                        PUSH    BANK,NOPAR,PARTHERE,4
7233 044540  012737  000002  002100               MOV     #2,NOPAR          ;INDICATE PARITY ACTION
7234 044546                                        TYPE    MSG029            ;EXAMINE MEMORY
7235 044552                                1$:     TYPE    MSG031            ;PHYSICAL ADDRESS (0-16777776)??
7236 044556  104413                               RDOCT                     ;READ OCTAL NUMBER ONTO STACK & $HIOCT
7237 044560  013737  074434  002106               MOV     $HIOCT,BANK       ;PUT MSB'S IN BANK
7238 044566                                        POP     R0                ;PUT LSB'S IN R0
7239 044570  000241                               CLC
7240 044572  006100                               ROL     R0
7241 044574  006137  002106                       ROL     BANK
7242 044600  000241                               CLC
7243 044602  006000                               ROR     R0
7244 044604                                        IF BANK GT #167 THEN GOTO 1$     ;CHECK FOR BANK TOO HIGH
7245 044614  062700  060000                       ADD     #FIRST,R0
7246 044620                                        IF #BIT0 SET IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
7247 044626                                        IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
7248 044634  012737  044706  002372               MOV     #3$,PARTHERE      ;INCASE OF ABORTS
7249 044642                                        SET4    #4$               ;TRAPS TO 4 GOTO 4$
7250 044650                                        MAP     BANK                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
7251 044664                                        SUPERVISOR                ;ENTER SUPERVISOR MODE
7252 044672  011001                               MOV     (R0),R1
7253 044674  104417                               KERNEL                    ;ENTER KERNEL MODE
7254 044676                                        TYPOCS  R1
7255 044704  000410                               BR      EXCMD3
7256
7257 044706                                3$:     TYPE    MSG032                    ;PARITY ABORT
7258 044712  000405                               BR      EXCMD3
7259
7260 044714  062706  000004                4$:     ADD     #4,SP                     ;FIX STACK
7261 044720                                        TYPE    MSG033                    ;TIMEOUT TRAP
7262 044724  000400                               BR      EXCMD3
7263
7264 044726  104417                       EXCMD3: KERNEL                    ;ENTER KERNEL MODE
7265 044730                                        POP     4,PARTHERE,NOPAR,BANK
7266 044750                                        RES4                      ;RESET TRAPS TO 4 TO DEFAULT
7267 044762  000207                               RETURN
```

```
                                        FSCMD4: SUBTST  <<FS     COMMAND 4       MODIFY MEMORY>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        FS      COMMAND 4       MODIFY MEMORY
                                        ;*****************************************************************************
7271 044764                                     PUSH    BANK,NOPAR,PARTHERE,4
7272 045004 012737  000003  002100              MOV     #3,NOPAR                ;INDICATE PARITY ACTION
7273 045012                                     TYPE    MSG036                  ;MODIFY MEMORY
7274 045016                             1$:     TYPE    MSG031          ;PHYSICAL ADDRESS (0-16777776)??
7275 045022 104413                              RDOCT                   ;READ OCTAL NUMBER ONTO STACK & $HIOCT
7276 045024 013737  074434  002106              MOV     $HIOCT,BANK     ;PUT MSB'S IN BANK
7277 045032                                     POP     R0              ;PUT LSB'S IN R0
7278 045034 000241                              CLC
7279 045036 006100                              ROL     R0
7280 045040 006137  002106                      ROL     BANK
7281 045044 000241                              CLC
7282 045046 006000                              ROR     R0
7283 045050                                     IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TOO HIGH
7284 045060 062700  060000                      ADD     #FIRST,R0
7285 045064                                     IF #BIT0 SET IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
7286 045072                                     IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
7287 045100 012737  045146  002372              MOV     #3$,PARTHERE            ;INCASE OF ABORTS
7288 045106                                     SET4    #4$             ;TRAPS TO 4 GOTO 4$
7289 045114                                     MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
7290 045130 104511                              INVALIDATE
7291 045132                                     SUPERVISOR              ;ENTER SUPERVISOR MODE
7292 045140 011001                              MOV     (R0),R1
7293                                            ;GETTING HERE MEANS WE GOT LUCKY - NO TRAPS
7294 045142 104417                              KERNEL                  ;ENTER KERNEL MODE
7295 045144 000410                              BR      5$
7296
7297 045146                             3$:     TYPE    MSG032                  ;PARITY ABORT
7298 045152 000431                              BR      EXCMD4                  ;EXIT
7299
7300 045154 062706  000004              4$:     ADD     #4,SP           ;FIX STACK
7301 045160                                     TYPE    MSG033          ;TIMEOUT TRAP
7302 045164 000424                              BR      EXCMD4                  ;EXIT
7303
7304 045166                             5$:     TYPE    MSG037                  ;OLD DATA WAS
7305 045172                                     TYPOCS  R1                      ;PRINT IT
7306 045200                                     TYPE    MSG039                  ;INPUT NEW DATA
7307 045204 104413                              RDOCT                           ;READ OCTAL NUMBER ONTO THE STACK
7308 045206                                     POP     R1                      ;GET NEW NUMBER
7309 045210                                     SUPERVISOR              ;ENTER SUPERVISOR MODE
7310 045216 010110                              MOV     R1,(R0)                 ;PUT IT IN MEMORY
7311 045220 011001                              MOV     (R0),R1                 ;READ IT AGAIN
7312 045222 104417                              KERNEL                  ;ENTER KERNEL MODE
7313 045224                                     TYPE    MSG038                  ;DATA IS NOW
7314 045230                                     TYPOCS  R1                      ;PRINT IT
7315
7316 045236 104417                      EXCMD4: KERNEL                  ;ENTER KERNEL MODE
7317 045240                                     POP     4,PARTHERE,NOPAR,BANK
7318 045260                                     RES4                    ;RESET TRAPS TO 4 TO DEFAULT
7319 045272 000207                              RETURN
```

```
 7322 045274                                FSCMD5: SUBTST  <<FS    COMMAND 5       SELECT BANK,MARGIN, & PATTERN>>
                                            ;*********************************************************************************
                                            ;*SUBTEST       FS      COMMAND 5       SELECT BANK,MARGIN, & PATTERN
                                            ;*********************************************************************************
 7323 045274                                        PUSH    BANK,PATTERN,MARGIN,CSRFIRST,PCBUMP,TKVEC,TKVEC+2
 7324 045330  013737  002112  002376               MOV     MARGIN,OLDMARGIN
 7325 045336  010637  002374                       MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK POINTER
 7326 045342                                        TYPE    MSG040                  ;SELECT BANK, MARGIN, & PATTERN TEST
 7327 045346                                1$:     TYPE    MSG030                  ;BANK(0-167)?
 7328 045352  104413                               RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7329 045354                                        POP     BANK                    ;PUT IT IN BANK
 7330 045360                                        IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TO HIGH
 7331
 7332 045370  013701  002106                       MOV     BANK,R1
 7333 045374  070127  000006                       MUL     #6,R1
 7334 045400                                        IF CPUBIT OFF.IN CONFIG(R1)
 7335 045410                                          TYPE  MSG041                  ;BANK NOT ACCESSABLE
 7336 045414                                          GOTO 1$
 7337 045416                                        END ;OF IF
 7338
 7339 045416                                2$:     TYPE    MSG042                  ;PATTERN(0-37)?
 7340 045422  104413                               RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7341 045424                                        POP     PATTERN                 ;PUT IT IN PATTERN
 7342 045430                                        IF PATTERN GT #37 THEN GOTO 2$  ;CHECK FOR PATTERN TO HIGH
 7343 045440                                        IF PATTERN EQ #0
 7344 045446                                          TYPE  MSG043                  ;PATTERN 0 DATA IS?
 7345 045452  104413                                 RDOCT                         ;READ AN OCTAL NUMBER ONTO THE STACK
 7346 045454                                          POP   R2                      ;PUT IT IN R2
 7347 045456                                        END ;OF IF
 7348
 7349 045456                                CMD5A:  TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
 7350 045462  104413                               RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7351 045464                                        POP     MARGIN                  ;PUT IN IN MARGIN
 7352 045470                                        IF MARGIN GT #5 OR MARGIN EQ #1
 7353 045510                                          GOTO CMD5A
 7354 045512                                        END ;OF IF
 7355 045512                                        IF MARGIN NE #0 AND #SW11 SET.IN @SWR
 7356 045530                                          TYPE  MSG045                  ;MARGINS INHIB TED BY SW11
 7357 045534                                          GOTO CMD5A
 7358 045536                                        END ;OF IF MARGIN
 7359
 7360 045536                                        MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
 7361 045552  104511                               INVALIDATE
 7362 045554  004737  042422                       CALL    EXBANK                  ;SET NEW MARGINS
 7363 045560                                        IF RRFLAG IS TRUE
 7364 045566                                          TYPE  MSG049                  ;BANK REQUIRES RELOCATION
 7365 045572                                          GOTO CMD5C
 7366 045574                                        END ;OF IF RRFLAG
 7367 045574  004737  043300                       CALL    COREHISTORY
 7368 045600                                        TYPE    MSG046          ;TO ESCAPE TYPE ANY KEY.
 7369 045604  012737  046052  000060               MOV     #CMD5C,TKVEC
 7370 045612  012737  000340  000062               MOV     #340,TKVEC+2
 7371 045620  017700  135150                       MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
 7372 045624  042737  000200  177776               BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
 7373 045632  052777  000100  135132               BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
 7374
 7375 045640  013700  002112                       MOV     MARGIN,R0               ;SET MARGINS
```

```
 7376 045644  006300                          ASL     R0                      ;SET MARGINS
 7377
 7378 045646  010037  177750                  MOV     R0,MAINT
 7379
 7380 045652                                  SET     HEADER,MUT
 7381 045666  005037  002362          CMD5B:  CLR     PASFLG
 7382 045672  012737  060000  002336          MOV     #FIRST,CSRFIRST
 7383 045700                                  IF #SW0 SET.IN @SWR
 7384 045710  104470                            ECCDIS                        ;DISABLE ERROR CORRECTION
 7385 045712                                  ELSE
 7386 045714  104502                            CLRCSR                        ;CLEAR MK11 CSRS
 7387 045716                                  END ;OF IF
 7388 045716  012737  000002  002100          MOV     #2,NOPAR                ;PARITY ACTION
 7389 045724  012737  000002  002406          MOV     #2,PCBUMP               ;TRAPS ADD 2 TO PC
 7390 045732  013700  002120                  MOV     PATTERN,R0
 7391 045736  006300                          ASL     R0
 7392 045740  004770  045752                  CALL    @FSPAT(R0)
 7393 045744  005037  002100                  CLR     NOPAR
 7394 045750  000746                          BR      CMD5B                   ;LOOP TILL KEYBOARD INTERRUPT
 7395
 7396 045752  021704                  FSPAT:  MT0000  ;<1 SEC         DATA PATTERN TEST
 7397 045754  021740                          MT0001  ;<1 SEC         ADDRESS TEST
 7398 045756  022000                          MT0002  ;<1 SEC         COMPLEMENT ADDRESS TEST
 7399 045760  022050                          MT0003  ; 1 SEC         3 XOR 9 WORST CASE NOISE TEST
 7400 045762  022216                          MT0004  ; 1 SEC         ROTATING ZEROS TEST
 7401 045764  022300                          MT0005  ; 1 SEC         ROTATING ONES TEST
 7402 045766  022360                          MT0006  ;<1 SEC         INITIAL DATA TEST
 7403 045770  022414                          MT0007  ;<1 SEC         ADDRESS BIT TEST
 7404 045772  022456                          MT0010  ;<1 SEC         BYTE ADDRESSING TEST
 7405 045774  022512                          MT0011  ;<2 SEC         CREATE SINGLE BIT ERROR TEST
 7406 045776  022570                          MT0012  ;<1 SEC         WRITE BYTE CLEARS SBE TEST
 7407 046000  022646                          MT0013  ; 1 SEC         CREATE DOUBLE BIT ERROR TEST
 7408 046002  022722                          MT0014  ; 1 SEC         WRITE INHIBIT DURING DATIP WITH DBE
 7409 046004  023000                          MT0015  ; 1 SEC         WRITE INHIBIT OF BYTE WITH DBE
 7410 046006  023056                          MT0016  ;<1 SEC         WRITE INHIBIT OF WORD WITH DBE
 7411 046010  023134                          MT0017  ;<1 SEC         HOLDING 1'S & 0'S TEST
 7412 046012  023156                          MT0020  ;<1 SEC         MARCHING 1'S & 0'S IN CHECK BITS
 7413 046014  023612                          MT0021  ; 1 SEC         MARCHING 0'S & 1'S TEST
 7414 046016  023734                          MT0022  ;10 SEC         REFRESH & SHIFTING DIAGONAL TEST
 7415 046020  023766                          MT0023  ;10 SEC         SHIFTING DIAGONAL TEST
 7416 046022  024032                          MT0024  ;20 SEC         FAST GALLOPING PATTERN TEST
 7417 046024  024172                          MT0025  ;<1 SEC         INTERRUPT ENABLE TEST
 7418 046026  024240                          MT0026  ;<1 SEC         RANDOM DATA TEST
 7419 046030  024370                          MT0027  ; 1 SEC         UNIQUE BANK TEST
 7420 046032  024754                          MT0030  ; 1 SEC         FLUSH OUT DBE'S TEST
 7421 046034  025214                          MT0031  ; 3 SEC         SOB-A-LONG TEST
 7422 046036  025772                          MT0999;MT0032
 7423 046040  025340                          MT0033  ;<1 SEC         WRITE RECOVERY TEST
 7424 046042  025530                          MT0034  ;35 SEC         BRANCH GOBBLE TEST
 7425 046044  025772                          MT0999;MT0035
 7426 046046  025772                          MT0999;MT0036
 7427 046050  025772                          MT0999;MT0037
 7428
 7429 046052  013706  002374          CMD5C:  MOV     FSSTACK,SP              ;RECOVER OLD STACK POINTER
 7430 046056  042777  000100  134706          BIC     #BIT6,@$TKS
 7431 046064                                  POP     TKVEC+2,TKVEC
 7432 046074  117700  134674                  MOVB    @$TKB,R0                ;GET CHARACTER TO GET RID OF FLAG
```

```
 7433 046100                                POP     PCBUMP,CSRFIRST,MARGIN
 7434 046114  004737  043300                CALL    COREHISTORY             ;RESTORE OLD MARGINS
 7435 046120                                POP     PATTERN,BANK
 7436 046130                                MAP     BANK                    ;REMAP OLD BANK
 7437 046144  004737  042422                CALL    EXBANK
 7438 046150  000207                        RETURN
 7439
 7440 046152                        FSCMD6: SUBTST  <<FS     COMMAND 6      TYPE CONFIGURATION MAP>>
                                    ;*****************************************************************************
                                    ;*SUBTEST        FS      COMMAND 6       TYPE CONFIGURATION MAP
                                    ;*****************************************************************************
 7441 046152  004737  035402                CALL    PCONFIG
 7442 046156  000207                        RETURN
 7443
```

```
 7447 046160                          FSCMD7: SUBTST  <<FS     COMMAND 7       BATTERY BACKUP TEST>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       FS       COMMAND 7       BATTERY BACKUP TEST
                                      ;*****************************************************************************
 7448 046160                                  PUSH    BANK,PATTERN,MARGIN,CSRNO,TKVEC,TKVEC+2
 7449 046210                                  SET     FS7FLAG
 7450 046216                                  IF #SW0 SET.IN @SWR
 7451 046226  104470                            ECCDIS                          ;DISABLE ERROR CORRECTION
 7452 046230                                  ELSE
 7453 046232  104502                            CLRCSR                          ;CLEAR MK11 CSRS
 7454 046234                                  END ;OF IF
 7455 046234                                  TYPE    MSG050          ;BATTERY BACKUP TEST
 7456                                                                 ;WRITING & CHECKING ADDRESS PATTERN AS BACKGROUND
 7457 046240  004737  024370                 CALL    MT0027                  ;CREATE & CHECK BACKGROUND
 7458 046244  012737  000012  002434         MOV     #10.,TIME
 7459 046252                                  TYPE    MSG052                  ;REMOVE SYSTEM POWER FOR
 7460 046256                                  TYPDEC  TIME
 7461 046264                                  TYPE    MSG053                  ;SECONDS MAX!
 7462 046270                                  TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY
 7463 046274  012737  046336  000060         MOV     #CMD7A,TKVEC
 7464 046302  012737  000340  000062         MOV     #340,TKVEC+2
 7465 046310  017700  134460                 MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
 7466 046314  042737  000200  177776         BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
 7467 046322  052777  000100  134442         BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
 7468 046330  010637  002374                 MOV     SP,FSSTACK
 7469
 7470 046334  000001                         WAIT
 7471
 7472 046336  013706  002374         CMD7A:  MOV     FSSTACK,SP              ;RECOVER OLD STACK POINTER
 7473 046342  042777  000100  134422         BIC     #BIT6,@$TKS
 7474 046350                                  POP     TKVEC+2,TKVEC
 7475 046360  117700  134410                 MOVB    @$TKB,R0                ;GET CHARACTER TO GET RID OF FLAG
 7476 046364                                  TYPE    MSG054                  ;NOW STARTING READ TEST OF MEMORY BANKS
 7477 046370                                  FOR BANK := #0 TO #167
 7478 046374  004737  042422                    CALL  EXBANK
 7479 046400                                    IF ACFLAG IS TRUE AND RRFLAG IS FALSE
 7480 046414  104511                              INVALIDATE
 7481 046416                                      LET R2 := BANK
 7482 046422  012700  060000                      MOV #FIRST,R0
 7483 046426  010004                              MOV R0,R4
 7484 046430  012701  040000                      MOV #SIZE,R1
 7485 046434  010103                              MOV R1,R3
 7486 046436  004737  026220                      CALL        SUPD03
 7487 046442                                    END ;OF IF ACFLAG
 7488 046442                                  END ;OF FOR BANK
 7489 046456                                  TYPE    MSG047                  ;TEST COMPLETE
 7490 046462  005037  002546                 CLR     FS7FLAG
 7491 046466                                  POP     CSRNO,MARGIN,PATTERN,BANK
 7492 046506  000207                         RETURN
 7493
```

```
7496 046510                                FSCMD8: SUBTST  <<FS     COMMAND 8       SOB-A-LONG TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       FS       COMMAND 8       SOB-A-LONG TEST
                                           ;*****************************************************************************
7497 046510                                        PUSH    BANK,PATTERN,MARGIN,TKVEC,TKVEC+2,NOPAR
7498 046540  010637  002374                        MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK POINTER
7499 046544                                        TYPE    MSG055                  ;SOB-A-LONG TEST
7500 046550                                CMD8A:  TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
7501 046554  104413                               RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
7502 046556                                        POP     MARGIN                  ;PUT IN IN MARGIN
7503 046562                                        IF MARGIN GT #5 OR MARGIN EQ #1
7504 046602                                          GOTO CMD8A
7505 046604                                        END ;OF IF
7506 046604                                        IF MARGIN NE #0 AND #SW11 SET.IN @SWR
7507 046622                                          TYPE  MSG045                  ;MARGINS INHIBITED BY SW11
7508 046626                                          GOTO CMD8A
7509 046630                                        END ;OF IF MARGIN
7510
7511 046630                                        IF #SW0 SET.IN @SWR
7512 046640  104470                                  ECCDIS                        ;DISABLE ERROR CORRECTION
7513 046642                                        ELSE
7514 046644  104502                                  CLRCSR                        ;CLEAR MK11 CSRS
7515 046646                                        END ;OF IF
7516 046646                                        TYPE    MSG056                  ;BELL = EACH PASS COMPLETE
7517
7518 046652                                        TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY!
7519 046656  012737  047014  000060                MOV     #CMD8C,TKVEC
7520 046664  012737  000340  000062                MOV     #340,TKVEC+2
7521 046672  017700  134076                        MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
7522 046676  042737  000200  177776                BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
7523 046704  052777  000100  134060                BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
7524
7525 046712  013700  002112                        MOV     MARGIN,R0               ;SET MARGINS
7526 046716  006300                               ASL     R0                      ;SET MARGINS
7527 046720  010037  177750                        MOV     R0,MAINT
7528
7529 046724                                        SET     HEADER,MUT
7530
7531 046740                                CMD8B:  FOR BANK := #0 TO #167
7532 046744  004737  042422                          CALL EXBANK
7533 046750                                          IF ACFLAG IS TRUE AND RRFLAG IS FALSE
7534 046764  104511                                     INVALIDATE
7535 046766  004737  025214                             CALL MT0031
7536 046772                                          END ;OF IF ACFLAG
7537 046772                                        END ;OF FOR BANK
7538 047006                                        TYPE    $BELL                   ;RING BELL
7539 047012                                        GOTO    CMD8B
7540
7541 047014  013706  002374                CMD8C:  MOV     FSSTACK,SP                      ;RECOVER OLD STACK POINTER
7542 047020  042777  000100  133744                BIC     #BIT6,@$TKS
7543 047026  117700  133742                        MOVB    @$TKB,R0                        ;READ CHAR TO KILL FLAG
7544 047032                                        POP     NOPAR,TKVEC+2,TKVEC,MARGIN,PATTERN,BANK
7545 047062                                        MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
7546 047076  004737  042422                        CALL    EXBANK
7547 047102  000207                               RETURN
```

```
 7550 047104                            FSCMD9: SUBTST  <<FS     COMMAND 9       SUPER TIGHT SCOPE LOOP>>
                                        ;*********************************************************************
                                        ;*SUBTEST       FS       COMMAND 9       SUPER TIGHT SCOPE LOOP
                                        ;*********************************************************************
 7551 047104                                    PUSH    BANK,MARGIN,TKVEC,TKVEC+2,NOPAR
 7552 047130  010637  002374                    MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK
 7553 047134                                    TYPE    MSG059                  ;SUPER TIGHT SCOPE LOOP
 7554 047140                                    IF #SW0 SET.IN @SWR
 7555 047150  104470                              ECCDIS                        ;DISABLE ERROR CORRECTION
 7556 047152                                    ELSE
 7557 047154  104502                              CLRCSR                        ;CLEAR MK11 CSRS
 7558 047156                                    END ;OF IF
 7559 047156                            1$:     TYPE    MSG031          ;PHYSICAL ADDRESS (0-16777776)??
 7560 047162  104413                            RDOCT                   ;READ OCTAL NUMBER ONTO STACK & $HIOCT
 7561 047164  013737  074434  002106            MOV     $HIOCT,BANK     ;PUT MSB'S IN BANK
 7562 047172                                    POP     R0              ;PUT LSB'S IN R0
 7563 047174  000241                            CLC
 7564 047176  006100                            ROL     R0
 7565 047200  006137  002106                    ROL     BANK
 7566 047204  000241                            CLC
 7567 047206  006000                            ROR     R0
 7568 047210                                    IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TOO HIGH
 7569 047220  062700  060000                    ADD     #FIRST,R0
 7570 047224                                    IF #BIT0 SET.IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
 7571 047232                                    IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
 7572
 7573 047240                            CMD9A:  TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
 7574 047244  104413                            RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7575 047246                                    POP     MARGIN                  ;PUT IN IN MARGIN
 7576 047252                                    IF MARGIN GT #5 OR MARGIN EQ #1
 7577 047272                                      GOTO CMD9A
 7578 047274                                    END ;OF IF
 7579 047274                                    IF MARGIN NE #0 AND #SW11 SET.IN @SWR
 7580 047312                                      TYPE  MSG045                  ;MARGINS INHIBITED BY SW11
 7581 047316                                      GOTO CMD9A
 7582 047320                                    END ;OF IF MARGIN
 7583
 7584 047320  012737  000003  002100            MOV     #3,NOPAR                ;PARITY ACTION
 7585 047326  012737  047444  002372            MOV     #CMD9LOOP,PARTHERE
 7586 047334                                    SET4    #CMD9B          ;TRAPS TO 4 GOTO CMD9B
 7587 047342                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
 7588 047356  104511                            INVALIDATE
 7589 047360                                    TYPE    MSG060                  ;SWR ---> MEM, MEM ---> DISPLAY
 7590
 7591 047364                                    TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY!
 7592 047370  012737  047464  000060            MOV     #CMD9C,TKVEC
 7593 047376  012737  000340  000062            MOV     #340,TKVEC+2
 7594 047404  017701  133364                    MOV     @$TKB,R1                ;KILL ANY OLD INTERRUPT
 7595 047410  042737  000200  177776            BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
 7596 047416  052777  000100  133346            BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
 7597
 7598 047424  013701  002112                    MOV     MARGIN,R1               ;SET MARGINS
 7599 047430  006301                            ASL     R1                      ;SET MARGINS
 7600 047432  010137  177750                    MOV     R1,MAINT
 7601
 7602 047436                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
 7603 047444  017710  133316            CMD9LOOP:MOV    @SWR,(R0)               ;WRITE SWITCH REGISTER INTO MEMORY
```

```
 7604 047450  011077  133314                    MOV     (R0),@DISPLAY           ;READ MEMORY INTO DISPLAY REGISTER
 7605 047454  000773                            BR      CMD9LOOP                ;LOOP TILL KEYBOARD INTERRUPT
 7606
 7607 047456  012716  047444          CMD9B:    MOV     #CMD9LOOP,(SP)
 7608 047462  000002                            RTI
 7609
 7610 047464  013706  002374          CMD9C:    MOV     FSSTACK,SP                      ;RECOVER OLD STACK POINTER
 7611 047470  042777  000100  133274            BIC     #BIT6,@$TKS
 7612 047476  117700  133272                    MOVB    @$TKB,R0                        ;READ CHAR TO KILL FLAG
 7613 047502                                    POP     NOPAR,TKVEC+2,TKVEC,MARGIN,BANK
 7614 047526                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
 7615 047542  004737  042422                    CALL    EXBANK
 7616 047546  000207                            RETURN
 7617
 7618 047550                          FCMD10:   SUBTST  <<FS     COMMAND 10      ERROR SUMMARY>>
                                               ;*****************************************************************************
                                               ;*SUBTEST       FS      COMMAND 10      ERROR SUMMARY
                                               ;*****************************************************************************
 7619 047550                                    PUSH    R0,R2,R3,BANK
 7620 047562                                    TYPDEC  $ERTTL
 7621 047570                                    TYPE    MSG079                  ;ERROR(S) DETECTED
 7622 047574                                    IF $ERTTL NE #0
 7623 047602  005037  002424                      CLR   SUCCESS
 7624 047606                                      FOR BANK := #0 TO #167
 7625 047612  013703  002106                        MOV BANK,R3
 7626 047616  070327  000006                        MUL #6,R3
 7627 047622  062703  000005                        ADD #5,R3
 7628 047626                                        IFB CONFIG(R3) NE #0
 7629 047634                                          IF SUCCESS IS FALSE
 7630 047642                                            TYPE    MSG076                  ;BANK  ERRORS
 7631 047646                                            SET SUCCESS
 7632 047654                                          END ;OF IF SUCCESS
 7633 047654                                          TYPOCS    BANK,3
 7634 047664  116300  003016                        MOVB      CONFIG(R3),R0
 7635 047670  042700  177400                        BIC       #^C377,R0
 7636 047674                                        TYPDEC    R0
 7637 047700                                        TYPE      $CRLF
 7638 047704                                        END ;OF IFB CONFIG(R3)
 7639 047704                                      END ;OF FOR BANK
 7640 047720                                    END ;OF IF $ERTTL
 7641 047720                                    POP     BANK,R3,R2,R0
 7642 047732  000207                            RETURN
```

```
 7645 047734                            FCMD11: SUBTST  <<FS    COMMAND 11      REFRESH TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       FS      COMMAND 11      REFRESH TEST
                                        ;*****************************************************************************
 7646 047734                                    PUSH    BANK,PATTERN,MARGIN,TKVEC,TKVEC+2,NOPAR
 7647 047764  010637  002374                    MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK POINTER
 7648 047770                                    TYPE    MSG073                  ;REFRESH TEST
 7649 047774                            CMD11A: TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
 7650 050000  104413                            RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7651 050002                                    POP     MARGIN                  ;PUT IN IN MARGIN
 7652 050006                                    IF MARGIN GT #5 OR MARGIN EQ #1
 7653 050026                                      GOTO CMD11A
 7654 050030                                    END ;OF IF
 7655 050030                                    IF MARGIN NE #0 AND #SW11 SET.IN @SWR
 7656 050046                                      TYPE  MSG045                  ;MARGINS INHIBITED BY SW11
 7657 050052                                      GOTO CMD11A
 7658 050054                                    END ;OF IF MARGIN
 7659
 7660 050054                                    IF #SW0 SET.IN @SWR
 7661 050064  104470                              ECCDIS                        ;DISABLE ERROR CORRECTION
 7662 050066                                    ELSE
 7663 050070  104502                              CLRCSR                        ;CLEAR MK11 CSRS
 7664 050072                                    END ;OF IF
 7665 050072                                    TYPE    MSG056                  ;BELL = EACH PASS COMPLETE
 7666
 7667 050076                                    TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY!
 7668 050102  012737  050240  000060            MOV     #CMD11C,TKVEC
 7669 050110  012737  000340  000062            MOV     #340,TKVEC+2
 7670 050116  017700  132652                    MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
 7671 050122  042737  000200  177776            BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
 7672 050130  052777  000100  132634            BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
 7673
 7674 050136  013700  002112                    MOV     MARGIN,R0               ;SET MARGINS
 7675 050142  006300                            ASL     R0                      ;SET MARGINS
 7676 050144  010037  177750                    MOV     R0,MAINT
 7677
 7678 050150                                    SET     HEADER,MUT
 7679
 7680 050164                            CMD11B: FOR BANK := #0 TO #167
 7681 050170  004737  042422                      CALL EXBANK
 7682 050174                                      IF ACFLAG IS TRUE AND RRFLAG IS FALSE
 7683 050210  104511
 7684 050212  004737  023734                        INVALIDATE
                                                    CALL MT0022
 7685 050216                                      END ;OF IF ACFLAG
 7686 050216                                    END ;OF FOR BANK
 7687 050232                                    TYPE    $BELL                   ;RING BELL
 7688 050236                                    GOTO    CMD11B
 7689
 7690 050240  013706  002374            CMD11C: MOV     FSSTACK,SP                      ;RECOVER OLD STACK POINTER
 7691 050244  042777  000100  132520            BIC     #BIT6,@$TKS
 7692 050252  117700  132516                    MOVB    @$TKB,R0                        ;READ CHAR TO KILL FLAG
 7693 050256                                    POP     NOPAR,TKVEC+2,TKVEC,MARGIN,PATTERN,BANK
 7694 050306                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
 7695 050322  004737  042422                    CALL    EXBANK
 7696 050326  000207                            RETURN
 7697
```

```
 7700 050330                        FCMD12: SUBTST  <<FS     COMMAND 12      SET FILL COUNT>>
                                    ;*********************************************************************
                                    ;*SUBTEST        FS      COMMAND 12      SET FILL COUNT
                                    ;*********************************************************************
 7701 050330                                PUSH    R0
 7702 050332                                TYPE    MSG085          ;FILL COUNT(OCTAL)?
 7703 050336  104413                        RDOCT
 7704 050340                                POP     R0
 7705 050342  042700  177760                BIC     #^C17,R0
 7706 050346  110037  002451                MOVB    R0,$FILLS
 7707 050352                                POP     R0
 7708 050354  000207                        RETURN
 7709
 7710 050356                        FCMD13: SUBTST  <<FS     COMMAND 13      ENTER KAMIKAZE MODE>>
                                    ;*********************************************************************
                                    ;*SUBTEST        FS      COMMAND 13      ENTER KAMIKAZE MODE
                                    ;*********************************************************************
 7711 050356                                TYPE    MSG101          ;ENTERING KAMIKAZE MODE
 7712 050362                                SET     KAMIKAZE,SKIPKAMI
 7713 050376  000207                        RETURN
 7714
 7715 050400                        FCMD14: SUBTST  <<FS     COMMAND 14      EXIT KAMIKAZE MODE>>
                                    ;*********************************************************************
                                    ;*SUBTEST        FS      COMMAND 14      EXIT KAMIKAZE MODE
                                    ;*********************************************************************
 7716 050400                                TYPE    MSG102          ;LEAVING KAMIKAZE MODE
 7717 050404  005037  002010                CLR     KAMIKAZE
 7718 050410                                SET     SKIPKAMI
 7719 050416  000207                        RETURN
 7720
 7721 050420                        FCMD15: SUBTST  <<FS     COMMAND 15      TURN CACHE OFF>>
                                    ;*********************************************************************
                                    ;*SUBTEST        FS      COMMAND 15      TURN CACHE OFF
                                    ;*********************************************************************
 7722 050420                                TYPE    MSG106                          ;CACHE IS OFF
 7723 050424  012737  001415  002700        MOV     #BIT0!BIT2!BIT3!BIT8!BIT9,CACHK
 7724 050432  104424                        CACHOFF                 ;TURN CACHE OFF
 7725 050434  000207                        RETURN
 7726
 7727 050436                        FCMD16: SUBTST  <<FS     COMMAND 16      TURN CACHE ON>>
                                    ;*********************************************************************
                                    ;*SUBTEST        FS      COMMAND 16      TURN CACHE ON
                                    ;*********************************************************************
 7728 050436                                TYPE    MSG107                  ;CACHE IS ON (EXCEPT DURING ACTUAL PATTERNS)
 7729 050442  012737  000001  002700        MOV     #BIT0,CACHK
 7730 050450  104423                        CACHON                  ;TURN CACHE ON
 7731 050452  000207                        RETURN
 7732
 7733 050454                        FCMD17: SUBTST  <<FS     COMMAND 17      RUN ONLY MULTIPORT TESTS>>
                                    ;*********************************************************************
                                    ;*SUBTEST        FS      COMMAND 17      RUN ONLY MULTIPORT TESTS
                                    ;*********************************************************************
 7734 050454                                TYPE    MSG108                  ;ONLY MULTIPORT TESTS WILL BE RUN
 7735 050460                                SET     MULTIONLY
 7736 050466  000207                        RETURN
```

```
 7739 050470                            FCMD18: SUBTST  <<FS     COMMAND 18      RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS>>
                                        ;*********************************************************************************
                                        ;*SUBTEST       FS       COMMAND 18      RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS
                                        ;*********************************************************************************
 7740 050470                                    TYPE     MSG109                  ;BOTH SINGLE & MULTIPORT TESTS WILL BE RUN
 7741 050474  005037  002004                    CLR      MULTIONLY
 7742 050500  000207                            RETURN
 7743
 7744 050502                            FCMD19: SUBTST  <<FS     COMMAND 19      TEST ONLY SELECTED BANKS>>
                                        ;*********************************************************************************
                                        ;*SUBTEST       FS       COMMAND 19      TEST ONLY SELECTED BANKS
                                        ;*********************************************************************************
 7745 050502                                    TYPE     MSG105          ;ENTER BANKS IN OCTAL - USE NUMBER OUTSIDE RANGE TO TERMINAT
 7746 050506  004737  050576                    CALL     CMD20A          ;ERASE OLD SELECTIONS
 7747 050512                                    BEGIN CMD19LOOP
 7748 050512                                      REPEAT
 7749 050512                                        TYPE         MSG030          ;BANK(0-167)?
 7750 050516  104413                                RDOCT                        ;READ AN OCTAL NUMBER ONTO THE STACK
 7751 050520                                        POP R1               ;PUT IT IN R1
 7752 050522                                        IF R1 GT #167 OR R1 LT #0
 7753 050534                                          LEAVE CMD19LOOP
 7754 050536                                        END ;OF IF R1
 7755 050536  070127  000006                        MUL #6,R1
 7756 050542  052761  040000  003020                BIS #BIT14,CONFIG+2(R1)
 7757 050550                                      END ;OF REPEAT
 7758 050552                                    END CMD20LOOP
 7759 050552                                    TYPE     MSG110          ;ONLY SELECTED BANKS WILL BE TESTED
 7760 050556                                    SET      SELONLY
 7761 050564  000207                            RETURN
 7762
 7763 050566                            FCMD20: SUBTST  <<FS     COMMAND 20      RESUME TESTING ALL BANKS>>
                                        ;*********************************************************************************
                                        ;*SUBTEST       FS       COMMAND 20      RESUME TESTING ALL BANKS
                                        ;*********************************************************************************
 7764 050566                                    TYPE     MSG111                  ;ALL BANKS WILL BE TESTED
 7765 050572  005037  002002                    CLR      SELONLY
 7766
 7767                                           ;ENTRY POINT FROM CMD19
 7768 050576                            CMD20A: FOR R1 := #0 TO #167*3*2 BY #6
 7769 050600  042761  040000  003020              BIC    #BIT14,CONFIG+2(R1)             ;DESELECT BANK
 7770 050606  042761  020000  003020              BIC    #BIT13,CONFIG+2(R1)             ;INVALIDATE BACKGROUND PATTERN
 7771 050614                                    END ;OF FOR R1
 7772 050626  000207                            RETURN
```

```
7775 050630                        WHICHCSR:SUBTST <<SUBR  DETERMINE CORRECT CSR>>
                                   ;*****************************************************************
                                   ;*SUBTEST        SUBR    DETERMINE CORRECT CSR
                                   ;*****************************************************************
7776 050630  013700  002334               MOV     MKCSRS,R0       ;GET CSR'S FLAG
7777 050634  122700  000200               CMPB    #BIT7,R0        ;CSR 0?
7778 050640  001003                       BNE     1$              ;NO - SKIP
7779 050642  005037  002256               CLR     CSRNO           ;YES - SET IT UP
7780 050646  000207                       RETURN
7781
7782 050650                        1$:    TYPE    MSG022          ;WHICH CSR(0-7)
7783 050654  104413                       RDOCT                   ;GET OCTAL NUMBER
7784 050656                               POP     R0              ;PUT IN R0
7785 050660  020027  000007               CMP     R0,#7           ;CHECK LIMIT
7786 050664  101371                       BHI     1$              ;IF BAD LOOP TILL HE TYPES IT RIGHT
7787 050666  012701  177774               MOV     #-4,R1
7788 050672  005200                       INC     R0
7789 050674  062701  000004        2$:    ADD     #4,R1
7790 050700  077003                       SOB     R0,2$
7791 050702  010137  002256               MOV     R1,CSRNO
7792 050706  000207                       RETURN
7793
```

```
                                        .TITLE  CEMKABO 1170 MAIN MEMORY DIAG 2
                                        .IDENT  /X01.60/
                                        .SBTTL  MULTIPROCESSOR SLAVE DISPATCHER
050710                          TASKRET:IF #MASTER NE CPUBIT
050720  000402                          BR      TASKDO
050722                                  ELSE
050724  000207                          RETURN
050726                                  END; OF IF #MASTER

050726  104424                  TASKDO: CACHOFF                 ;TURN CACHE OFF
050730                                  MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
050744                                  SET     R0
050750                                  FOR R1 := #0 TO #6 BY #2
050752                                    IF R0 EQ ONES
050760                                      IF NOIIST IS TRUE
050766  013702  177764                        MOV     SYSTID,R2
050772                                      ELSE
050774  017702  131736                        MOV     @IISTACR,R2
051000  072227  177770                        ASH     #-8.,R2
051004  042702  177774                        BIC     #^C3,R2
051010                                      END ;OF IF NOIIST
051010                                      SUPERVISOR          ;ENTER SUPERVISOR MODE
051016                                      IF FIRST+PORTDIR(R1) EQ R2 THEN LET R0 := R1
051026  104417                              KERNEL                  ;ENTER KERNEL MODE
051030                                    END ;OF IF R0
051030                                  END ;OF FOR R1
051042                                  IF R0 EQ ONES
051050                                    FATAL 41
051056                                  END ;OF IF R0
051056                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
051064  005760  062616          1$:     TST     FIRST+TASK(R0)          ;WAIT FOR COMMAND
051070  003775                          BLE     1$
051072  013737  062676  002676        MOV     FIRST+MDISPLAY,MDISPLAY
051100  013777  002676  131662        MOV     MDISPLAY,@DISPLAY
051106  116001  062616                MOVB    FIRST+TASK(R0),R1       ;GET COMMAND
051112  104417                          KERNEL                  ;ENTER KERNEL MODE
051114                                  PUSH    R0
051116                                  CASE    R1
051126  051234                            TASK00                        ;0 IS NOT A COMMAND
051130  051236                            TASK01                        ;MOVE PROGRAM TO BANK
051132  051330                            TASK02                        ;WRITE ONLY PATTERN IN HI BYTE
051134  051430                            TASK03                        ;READ ONLY PATTERN IN HI BYTE
051136  051664                            TASK04                        ;EXECUTION CONTENTION TEST
051140  051774                            TASK05                        ;PORT ARBITRATION SYMMETRY TEST
051142  052300                            TASK06                        ;STOP PROGRAM
051144  052326                            TASK07                        ;WRITE ONLY ADDRESS PATTERN
051146  052336                            TASK10                        ;READ ONLY ADDRESS PATTERN
051150  052536                            TASK11                        ;ASYNCHRONOUS ADDRESS UNIQUENESS TEST
051152  052644                            TASK12                        ;SKEWED UP ADDRESS TEST
051154  052726                            TASK13                        ;SETUP FOR ASRB TEST
051156  053276                            TASK14                        ;RESET FROM ASRB TEST
051160  053310                            TASK15                        ;RUN CSR TESTS
051162  053316                            TASK16                        ;SET MARGIN 6, CPU HAS I/O PRIORITY
051164  053334                            TASK17                        ;CREATE STALE DATA TEST
051166  053422                            TASK20                        ;CACHE FLUSH TEST
051170                                  END ;OF CASE R1
051176                                  POP     R0
```

```
     58 051200                                          MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
     59 051214                                          SUPERVISOR                  ;ENTER SUPERVISOR MODE
     60 051222  052760  100000  062616                 BIS     #BIT15,FIRST+TASK(R0)   ;INDICATE DONE
     61 051230  104417                                  KERNEL                      ;ENTER KERNEL MODE
     62 051232  000626                                  BR      TASKRET
     63 051234  000207                        TASK00:   RETURN
```

```
     66 051236                                  TASK01: SUBTST  <<MOVE PROGRAM TO NEW BANK>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        MOVE PROGRAM TO NEW BANK
                                                ;*****************************************************************************
     67 051236                                          SUPERVISOR              ;ENTER SUPERVISOR MODE
     68 051244  013700  062106                          MOV     FIRST+BANK,R0
     69 051250  104417                                  KERNEL                  ;ENTER KERNEL MODE
     70 051252  004737  041456                          CALL    RELOC1
     71 051256  012737  002000  002706                  MOV     #STACK,KSTACK
     72 051264                                          POP     R1,R0                   ;GET OLD RETURN & R0
     73 051270  013706  002706                          MOV     KSTACK,SP
     74 051274                                          PUSH    R0,R1                   ;PUT BACK R0 & RETURN
     75 051300                                          MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
     76 051314  005037  002134                          CLR     RLFLAG
     77 051320                                          SET     NOSCOPE                 ;NO SCOPE LOOPS ALLOWED IN MULTIPROCESSOR TESTS
     78 051326  000207                                  RETURN
     79
     80 051330                                  TASK02: SUBTST  <<WRITE ONLY PATTERN IN HI BYTE>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        WRITE ONLY PATTERN IN HI BYTE
                                                ;*****************************************************************************
     81 051330                                          SUPERVISOR              ;ENTER SUPERVISOR MODE
     82 051336  116005  062617                          MOVB    FIRST+TASK+1(R0),R5
     83 051342  013737  062106  002'06                  MOV     FIRST+BANK,BANK
     84 051350  104417                                  KERNEL                  ;ENTER KERNEL MODE
     85 051352                                          SET     WRITEONLY
     86 051360  012700  060000                          MOV     #FIRST,R0
     87 051364  012701  040000                          MOV     #SIZE,R1
     88 051370                                          CASE    R5
     89 051400  051530                                    SLPAT0                ;ZEROS
     90 051402  051534                                    SLPAT1                ;ONES
     91 051404  051542                                    SLPAT2                ;125252
     92 051406  051550                                    SLPAT3                ;52525
     93 051410  051556                                    SLPAT4                ;377
     94 051412  051564                                    SLPAT5                ;177400
     95 051414                                          END ;OF CASE R5
     96 051422  005037  002502                          CLR     WRITEONLY
     97 051426  000207                                  RETURN
```

```
                                TASK03: SUBTST  <<READ ONLY PATTERN IN HI BYTE>>
                                ;*************************************************************************
                                ;*SUBTEST        READ ONLY PATTERN IN HI BYTE
                                ;*************************************************************************
101 051430                              SUPERVISOR              ;ENTER SUPERVISOR MODE
102 051436  116005  062617              MOVB    FIRST+TASK+1(R0),R5
103 051442  013737  062106  002106      MOV     FIRST+BANK,BANK
104 051450  104417                      KERNEL                  ;ENTER KERNEL MODE
105 051452                              SET     READONLY
106 051460  012700  060000              MOV     #FIRST,R0
107 051464  012701  040000              MOV     #SIZE,R1
108 051470                              CASE    R5
109 051500  051530                        SLPAT0                ;ZEROS
110 051502  051534                        SLPAT1                ;ONES
111 051504  051542                        SLPAT2                ;125252
112 051506  051550                        SLPAT3                ;52525
113 051510  051556                        SLPAT4                ;377
114 051512  051564                        SLPAT5                ;177400
115 051514                              END ;OF CASE R5
116 051522  005037  002504              CLR     READONLY
117 051526  000207                      RETURN
118
119 051530  005002                SLPAT0: CLR     R2
120 051532  000416                      BR      SLPAT
121 051534                        SLPAT1: SET     R2
122 051540  000413                      BR      SLPAT
123 051542  012702  125252        SLPAT2: MOV     #125252,R2
124 051546  000410                      BR      SLPAT
125 051550  012702  052525        SLPAT3: MOV     #52525,R2
126 051554  000405                      BR      SLPAT
127 051556  012702  000377        SLPAT4: MOV     #377,R2
128 051562  000402                      BR      SLPAT
129 051564  012702  177400        SLPAT5: MOV     #177400,R2
130 051570                        SLPAT:  SUBTST  <<SLAVE PATTERNS>>
                                ;*************************************************************************
                                ;*SUBTEST        SLAVE PATTERNS
                                ;*************************************************************************
131 051570                              CLEAR   MARGIN,MAINT
132 051600  104502                      CLRCSR                  ;CLEAR MK11 CSRS
133 051602                              BMOV    MTP000
134 051610  012737  000207  177644      MOV     #207,UIPAR2             ;PUT RETURN INST AFTER WRITE ROUTINE
135 051616  012737  177646  002360      MOV     #UIPAR3,SUPDOADD
136 051624  004737  035204              CALL    REGCOPY
137 051630  104415                      SAVREG
138 051632                              IF WRITEONLY IS TRUE THEN $CALL SUPD01
139 051644                              IF READONLY IS TRUE THEN $CALL SUPD03
140 051656  104416                      RESREG
141 051660  104424                      CACHOFF                 ;TURN CACHE OFF
142 051662  000207                      RETURN
```

```
                                        TASK04: SUBTST  <<EXECUTION CONTENTION TEST>>
                                        ;*************************************************************************
                                        ;*SUBTEST        EXECUTION CONTENTION TEST
                                        ;*************************************************************************
146 051664                                      SUPERVISOR                      ;ENTER SUPERVISOR MODE
147 051672  013737  062106  002106              MOV     FIRST+BANK,BANK
148 051700  104417                              KERNEL                          ;ENTER KERNEL MODE
149 C 1702  005060  002636                      CLR     PTYBUF(R0)
150 051706  012737  000037  002366              MOV     #37,REALPAT
151 051714  012737  060000  002360              MOV     #FIRST,SUPD0ADD
152 051722                                      PUSH    R0
153 051724  062700  002636                      ADD     #PTYBUF,R0              ;R0 - PTYBUF + INDEX FOR CPU
154 051730  004737  026220                      CALL    SUPD03
155 051734  104424                              CACHOFF                         ;TURN CACHE OFF
156 051736                                      MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
157 051752                                      POP     R0
158 051754                                      SUPERVISOR                      ;ENTER SUPERVISOR MODE
159 051762  016060  002636  062636              MOV     PTYBUF(R0),FIRST+PTYBUF(R0)
160 051770  104417                              KERNEL                          ;ENTER KERNEL MODE
161 051772  000207                              RETURN
```

```
                                        TASK05: SUBTST  <<PORT ARBITRATION SYMMETRY TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       PORT ARBITRATION SYMMETRY TEST
                                        ;*****************************************************************************
                                                SUPERVISOR                      ;ENTER SUPERVISOR MODE
052002  013737  062106  002106                  MOV     FIRST+BANK,BANK
052010  104417                                  KERNEL                          ;ENTER KERNEL MODE
052012                                          MAP     BANK
052026                                          SUPERVISOR                              ;ENTER SUPERVISOR MODE
052034                                          BMOV    TSK05A,FIRST+2
052044  104417                                  KERNEL                                  ;ENTER KERNEL MODE
052046  005060  002646                          CLR     PORTCOUNT(R0)
052052  010004                                  MOV     R0,R4
052054                                          PUSH    100,102
052064  012737  052224  000100                  MOV     #1$,100
052072  012737  000340  000102                  MOV     #340,102
052100  012737  000100  177546                  MOV     #BIT6,LKS               ;ENABLE INTERRUPTS
052106  005000                                  CLR     R0
052110  012701  060000                          MOV     #FIRST,R1
052114  000235                                  SPL     5
052116  012737  060002  002360                  MOV     #FIRST+2,SUPDOADD
052124  004737  026234                          CALL    SUPD04
052130  104424                                  CACHOFF                         ;TURN CACHE OFF
052132  005037  177546                          CLR     LKS
052136  000237                                  SPL     7
052140  004737  026234                          CALL    SUPD04                  ;DO TEST AS BACKGND WHILE OTHERR CPU'S FINISH
052144  104424                                  CACHOFF
052146                                          MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
052162  010400                                  MOV     R4,R0
052164                                          SUPERVISOR                      ;ENTER SUPERVISOR MODE
052172  016060  002646  062646                  MOV     PORTCOUNT(R0),FIRST+PORTCOUNT(R0)
052200  104417                                  KERNEL                          ;ENTER KERNEL MODE
052202                                          CLEAR   MARGIN,MAINT
052212                                          POP     102,100
052222  000207                                  RETURN
052224                                  ^$:     PUSH    R0
052226  010400                                  MOV     R4,R0
052230  005260  002646                          INC     PORTCOUNT(R0)
052234                                          POP     R0
052236  000002                                  RTI
052240  010505                          TSK05A: MOV     R5,R5
052242  010505                                  MOV     R5,R5
052244  010505                                  MOV     R5,R5
052246  010505                                  MOV     R5,R5
052250  010505                                  MOV     R5,R5
052252  010505                                  MOV     R5,R5
052254  010505                                  MOV     R5,R5
052256  010505                                  MOV     R5,R5
052260  010505                                  MOV     R5,R5
052262  010505                                  MOV     R5,R5
052264  010505                                  MOV     R5,R5
052266  010505                                  MOV     R5,R5
052270  010505                                  MOV     R5,R5
052272  010505                                  MOV     R5,R5
052274  077017                                  SOB     R0,TSK05A
052276  000207                                  RETURN
```

```
219 052300                              TASK06: SUBTST  <<STOP SLAVE PROGRAM>>
                                        ;*************************************************************************
                                        ;*SUBTEST        STOP SLAVE PROGRAM
                                        ;*************************************************************************
220 052300  012706  000700                          MOV     #USESTK,SP
221 052304  042737  001001  177572      STOPCPU:    BIC     #BIT9!BIT0,MMR0         ;DEENERGIZE MEMORY MANAGEMENT
222 052312  005037  002676                          CLR     @DISPLAY
223 052316  005077  130446                          CLR     @DISPLAY
224 052322  000137  011720                          JMP     STOPCPU
225
226 052326                              TASK07: SUBTST  <<WRITE ONLY ADDRESS PATTERN IN HI BYTE>>
                                        ;*************************************************************************
                                        ;*SUBTEST        WRITE ONLY ADDRESS PATTERN IN HI BYTE
                                        ;*************************************************************************
227 052326                                          SET     WRITEONLY
228 052334  000403                                 BR      TASK7A
229
230 052336                              TASK10: SUBTST  <<READ ONLY ADDRESS PATTERN IN HI BYTE>>
                                        ;*************************************************************************
                                        ;*SUBTEST        READ ONLY ADDRESS PATTERN IN HI BYTE
                                        ;*************************************************************************
231 052336                                          SET     READONLY
232 052344                              TASK7A:     SUPERVISOR              ;ENTER SUPERVISOR MODE
233 052352  116001  062617                          MOVB    FIRST+TASK+1(R0),R1
234 052356  013737  062106  002106                  MOV     FIRST+BANK,BANK
235 052364  104417                                  KERNEL                  ;ENTER KERNEL MODE
236 052366                                          IF R1 EQ #0
237 052372                                            BMOV  MTP001          ;ADDRESS PATTERN
238 052400  012700  060000                            MOV   #FIRST,R0
239 052404  005002                                    CLR   R2
240 052406  010004                                    MOV   R0,R4
241 052410  010205                                    MOV   R2,R5
242 052412                                          ELSE
243 052414                                            BMOV  MTP002          ;COMPLEMENT ADDRESS PATTERN
244 052422  012700  160000                            MOV   #LAST+2,R0
245 052426  012702  000001                            MOV   #1,R2
246 052432  012704  060000                            MOV   #FIRST,R4
247 052436  012705  100001                            MOV   #100001,R5
248 052442                                          END ;OF IF R1
249 052442  012701  040000                          MOV     #SIZE,R1
250 052446  010103                                  MOV     R1,R3
251 052450  012737  000207  177650                  MOV     #207,UIPAR4     ;RETURN INSTRUCTION
252 052456  012737  177652  002360                  MOV     #UIPAR5,SUPDOADD        ;READ ONLY STARTING ADDRESS
253 052464                                          CLEAR   MARGIN,MAINT
254 052474  104502                                  CLRCSR                  ;CLEAR MK11 CSRS
255 052476                                          IF WRITEONLY IS TRUE THEN $CALL SUPD01
256 052510                                          IF READONLY IS TRUE THEN $CALL SUPD03
257 052522  104424                                  CACHOFF                 ;TURN CACHE OFF
258 052524                                          CLEAR   READONLY,WRITEONLY
259 052534  000207                                  RETURN
```

```
    262 052536                          TASK11: SUBTST  <<RUN FIVE PATTERNS IN DESIGNATED 1/4 BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       RUN FIVE PATTERNS IN DESIGNATED 1/4 BANK
                                        ;*****************************************************************************
    263 052536                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
    264 052544  116001  062617                  MOVB    FIRST+TASK+1(R0),R1
    265 052550  013737  062106  002106          MOV     FIRST+BANK,BANK
    266 052556  104417                          KERNEL                  ;ENTER KERNEL MODE
    267 052560  072127  000011                  ASH     #9.,R1
    268 052564  010100                          MOV     R1,R0
    269 052566  012701  010000                  MOV     #SIZE/4,R1
    270 052572                                  SET     WRITEONLY,READONLY
    271 052606  004737  051530                  CALL    SLPAT0
    272 052612  004737  051534                  CALL    SLPAT1
    273 052616  004737  051542                  CALL    SLPAT2
    274 052622  004737  051550                  CALL    SLPAT3
    275 052626  004737  051556                  CALL    SLPAT4
    276 052632                                  CLEAR   WRITEONLY,READONLY
    277 052642  000207                          RETURN
    278
    279 052644                          TASK12: SUBTST  <<WRITE & READ A SKEWED UP ADDRESS TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       WRITE & READ A SKEWED UP ADDRESS TEST
                                        ;*****************************************************************************
    280 052644                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
    281 052652  116001  062617                  MOVB    FIRST+TASK+1(R0),R1
    282 052656  104417                          KERNEL                  ;ENTER KERNEL MODE
    283
    284                                         ;PAY ATTENTION NOW!
    285                                         ;R0 = MULTIPORT ID # (0,2,4,6)
    286                                         ;R1 = OFFSET STARTING ADDRESS (0,2,4,6)
    287 052660  010004                          MOV     R0,R4
    288 052662  060104                          ADD     R1,R4           ;R4 IS NOW UNIQUE AMONST THE 4 CPU'S
    289
    290 052664  012705  010000                  MOV     #SIZE/4,R5
    291 052670  012703  060000                  MOV     #FIRST,R3
    292 052674                                  BMOV    MTPA32
    293 052702  104415                          SAVREG
    294 052704  004737  026042                  CALL    SUPD01
    295 052710                                  BMOV    MTPB32
    296 052716  104416                          RESREG
    297 052720  004737  026056                  CALL    SUPD02
    298 052724  000207                          RETURN
```

```
                                                        TASK13: SUBTST  <<SETUP FOR ASRB TEST>>
                                                        ;*****************************************************************************
                                                        ;*SUBTEST        SETUP FOR ASRB TEST
                                                        ;*****************************************************************************
052726                                                          BMOV    TSK13A
052734  012777  177640  130000                                MOV     #UIPAR0,@IISTVEC        ;CAUSE WE SIMULATE TRAPS
052742                                                          SUPERVISOR                      ;ENTER SUPERVISOR MODE
052750  013737  062106  002106                                MOV     FIRST+BANK,BANK
052756  052760  100000  062616                                BIS     #BIT15,FIRST+TASK(R0)   ;ACK
052764  104417                                                KERNEL                          ;ENTER KERNEL MODE
052766                                                          MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
053002                                                          IF CPUBIT NE #MASTER
053012                                                            FOR R2 := #FIRST TO #FIRST+34 BY #4
053016                                                              FOR I := #1 TO #1000.
053024                                                                SUPERVISOR              ;ENTER SUPERVISOR MODE
053032  005737  060002                                1$:             TST     FIRST+2
053036  001775                                                        BEQ     1$
                                                                    ;DISPATCH THRU THE IIST VECTOR
053040  017701  127676                                              MOV     @IISTVEC,R1
053044  004711                                                      CALL    (R1)
053046                                                              END ;OF FOR I
053062                                                            END ;OF FOR R2
053074  104417                                                    KERNEL                  ;ENTER KERNEL MODE
053076                                                          END ;OF IF CPUBIT
053076  000207                                                  RETURN

053100  000240                                TSK13A: NOP                             ;V177640
053102  000240                                        NOP                             ;V177642
053104  000240                                        NOP                             ;V177644
053106  000240                                        NOP                             ;V177646
053110  000240                                        NOP                             ;V177650
053112  000240                                        NOP                             ;V177652
053114  000240                                        NOP                             ;V177654
053116  000240                                        NOP                             ;V177656
053120  000240                                        NOP                             ;V177660
053122                                                  SUPERVISOR                      ;V177662 ;ENTER SUPERVISOR MODE
053130  106212                                          ASRB    (R2)                    ;V177670
053132  000137  053136                                  JMP     TSK13B                  ;V177672
```

```
338 053136                              TSK13B: SUBTST  <<RECOVER FROM TASK13 - TRAP FROM IIST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       RECOVER FROM TASK13 - TRAP FROM IIST
                                        ;*****************************************************************************
339 053136                                      ON.ERROR
340 053140                                        SET   SLFLAG(R0)                        ;I LOCKED IT
341 053146  163777  002730  127566              SUB   SLAVES,@IISTVEC
342 053154  163777  002730  127560              SUB   SLAVES,@IISTVEC
343 053162                                      IF @IISTVEC LO #UIPAR0 THEN LET @IISTVEC := #UIPAR0
344 053200                                      ELSE
345 053202  005060  002656                        CLR   SLFLAG(R0)                        ;IT WAS LOCKED BY SOMEONE ELSE
346 053206  062777  000002  127526              ADD   #2,@IISTVEC
347 053214                                      IF @IISTVEC HI #UDPAR1 THEN LET @IISTVEC := #UDPAR1
348 053232                                      END ;OF ON.NOERROR
349 053232                                      MAP     #0                              ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
350 053246  016060  002656  062656              MOV     SLFLAG(R0),FIRST+SLFLAG(R0)
351 053254                                      MAP     BANK                            ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
352 053270  005037  060002                      CLR     FIRST+2
353 053274  000207                              RETURN
```

```
                                TASK14: SUBTST  <<RESET FROM ASRB TEST>>
                                ;*******************************************************************************
                                ;*SUBTEST        RESET FROM ASRB TEST
                                ;*******************************************************************************
053276  000237                          SPL     7
053300  012777  061216  127434          MOV     #SLAVUP,@IISTVEC
053306  000207                          RETURN

                                TASK15: SUBTST  <<RUN SLAVE IN CSR TESTS>>
                                ;*******************************************************************************
                                ;*SUBTEST        RUN SLAVE IN CSR TESTS
                                ;*******************************************************************************
053310  004737  016664                  CALL    MKCONTROL
053314  000207                          RETURN

                                TASK16: SUBTST  <<SET MARGIN 6, CPU HAS I/O PRIORITY>>
                                ;*******************************************************************************
                                ;*SUBTEST        SET MARGIN 6, CPU HAS I/O PRIORITY
                                ;*******************************************************************************
053316  012737  000014  177750          MOV     #14,MAINT
053324  012737  000006  002112          MOV     #6,MARGIN
053332  000207                          RETURN

                                TASK17: SUBTST  <<CREATE STALE DATA TEST>>
                                ;*******************************************************************************
                                ;*SUBTEST        CREATE STALE DATA TEST
                                ;*******************************************************************************
053334                                  SUPERVISOR
053342  013737  062106  002106          MOV     FIRST+BANK,BANK
053350  104417                          KERNEL
053352                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
053366                                  SUPERVISOR                      ;ENTER SUPERVISOR MODE
053374  012700  060000                  MOV     #FIRST,R0
053400  012701  060004                  MOV     #FIRST+4,R1
053404  022711  047507          1$:     CMP     #'GO,(R1)               ;TIME TO GO?
053410  001375                          BNE     1$                      ;NO - LOOP
053412  012710  177777                  MOV     #-1,(R0)                ;WRITE WORD
053416  104417                          KERNEL                          ;ENTER KERNEL MODE
053420  000207                          RETURN
```

```
 385 053422                                 TASK20: SUBTST  <<CACHE FLUSH TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        CACHE FLUSH TEST
                                            ;*****************************************************************************
 386 053422                                         BMOV    TSK20A
 387 053430                                         SUPERVISOR                          ;ENTER SUPERVISOR MODE
 388 053436  013737  062106  002106                 MOV     FIRST+BANK,BANK
 389 053444  104417                                 KERNEL                              ;RETURN TO KERNEL MODE
 390 053446                                         MAP     BANK
 391 053462  012700  060000                         MOV     #FIRST,R0
 392 053466  012701  060004                         MOV     #FIRST+4,R1
 393 053472  005002                                 CLR     R2
 394
 395                                                ;WAIT FOR ANY FLUSH TO FINISH
 396 053474  077201                         1$:     SOB     R2,1$
 397
 398 053476                                         SUPERVISOR                          ;ENTER SUPERVISOR MODE
 399 053504  004737  177640                         CALL    FASTCITY
 400 053510  005060  000004                         CLR     4(R0)                       ;KILL THE GO SIGNAL
 401 053514  104417                                 KERNEL                              ;ENTER KERNEL MODE
 402
 403                                                ;VERIFY STALE DATA
 404 053516  022701  000000                         CMP     #0,R1                       ;CHECK FOR STALE DATA
 405 053522  001411                                 BEQ     2$                          ;OK - SKIP
 406 053524  012737  000000  002050                 MOV     #0,GOOD                     ;REPORT ERROR
 407 053532  010137  002056                         MOV     R1,BAD
 408 053536  012737  060000  002040                 MOV     #FIRST,ADDRESS
 409 053544  104055                                 ERROR   +55
 410
 411                                                ;VERIFY THAT FLUSHING GETS RID OF STALE DATA
 412 053546  022702  177777                 2$:     CMP     #-1,R2                      ;CHECK FOR GOOD DATA
 413 053552  001411                                 BEQ     5$                          ;OK - SKIP
 414 053554  012737  177777  002050                 MOV     #-1,GOOD                    ;REPORT ERROR
 415 053562  010237  002056                         MOV     R2,BAD
 416 053566  012737  060000  002040                 MOV     #FIRST,ADDRESS
 417 053574  104056                                 ERROR   +56
 418
 419 053576  104424                         5$:     CACHOFF                 ;TURN CACHE OFF
 420 053600  000207                                 RETURN
 421
 422 053602                                 TSK20A: SUBTST  <<CACHE FLUSH TEST (FOR PAR'S)>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        CACHE FLUSH TEST (FOR PAR'S)
                                            ;*****************************************************************************
 423 053602  012737  000401  177746                 MOV     #BIT8!BIT0,CONTRL           ;V177640 ;TURN ON CACHE & FLUSH IT!
 424 053610  012710  000000                         MOV     #0,(R0)                     ;V177646 ;WRITE FRESH DATA
 425 053614  005710                                 TST     (R0)                        ;V177652  ;READ - CREATING A CACHE HIT
 426 053616  012711  047507                         MOV     #'GO,(R1)                   ;V177654  ;SIGNAL SLAVES TO MAKE STALE DATA
 427 053622  077201                         1$:     SOB     R2,1$                       ;V177660  ;WAIT FOR SLAVES TO FINISH
 428 053624  011001                                 MOV     (R0),R1                     ;V177662  ;STALE DATA ---> R1
 429 053626  012737  000401  177746                 MOV     #BIT8!BIT0,CONTRL           ;V177664  ;FLUSH CACHE AGAIN
 430 053634  011002                                 MOV     (R0),R2                     ;V177672  ;FRESH DATA ---> R2
 431 053636  000207                                 RETURN                              ;V177674
```

```
                                    MRUNSETUP:SUBTST        <<SETUP EXECUTION CONTENTION TEST>>
                                    ;*****************************************************************************
                                    ;*SUBTEST        SETUP EXECUTION CONTENTION TEST
                                    ;*****************************************************************************
                                            MAP     BANK                            ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
                                            MOV     #FIRST,R0
                                            WHILE R0 LO #LAST
                                              CALL  $RAND
                                              MOV   SEEDHI,R1
                                              MOV   #16.,R2
                                              SUPERVISOR                    ;ENTER SUPERVISOR MODE
                                              THRU R2
                                                ROL R1
                                                ON.ERROR
                                                  MOV       #5210,(R0)+     ;INC (R0) INSTRUCTION
                                                ELSE
                                                  MOV       #5710,(R0)+     ;TST (R0) INSTRUCTION
                                                END ;OF ON.ERROR
                                              END ;OF THRU R2
                                              KERNEL                        ;ENTER KERNEL MODE
                                            END ;OF WHILE R0
                                            SUPERVISOR                      ;ENTER SUPERVISOR MODE
                                            MOV     #207,-(R0)                ;RETURN INSTRUCTION
                                            KERNEL                          ;ENTER KERNEL MODE
                                            RETURN
```

```
                                    SUPM13: SUBTST  <<MULTIPORT ASRB TEST (IN SUPERVISOR SPACE)>>
                                    ;*****************************************************************************
                                    ;*SUBTEST        MULTIPORT ASRB TEST (IN SUPERVISOR SPACE)
                                    ;*****************************************************************************
                                            .ENABL  LSB
053752  012737  177765  002676            MOV     #-13,MDISPLAY
053760  013777  002676  127002            MOV     MDISPLAY,@DISPLAY
053766                                    FOR BANK := #1 TO #167
053774  013737  002510  002114              MOV   ALLCPUS,CPUBIT
054002  004737  042422                      CALL  EXBANK
054006  012737  000020  002114              MOV   #MASTER,CPUBIT
054014                                      IF PFLAG IS FALSE AND ACFLAG IS TRUE
054030                                        MAP BANK                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
054044                                        SUPERVISOR                      ;ENTER SUPERVISOR
054052                                        CLEAR PORTCOUNT,PORTCOUNT+2,PORTCOUNT+4,PORTCOUNT+6,FIRST+2
054076  104417                                KERNEL                          ;ENTER KERNEL MODE
054100                                        FOR R0 := #0 TO SLAVES
054102  010001                                  MOV       R0,R1
054104  006301                                  ASL       R1
054106  012761  000013  002616                  MOV       #13,TASK(R1)              ;ORDERS TO SETUP FOR ASRB TEST
054114                                        END ;OF FOR R0
054124  004737  050726                        CALL        TASKDO
054130                                        MAP BANK
054144                                        FOR R0 := #0 TO SLAVES
054146  010001                                  MOV       R0,R1
054150  006301                                  ASL       R1
054152  012737  061165  002574                  MOV       #5*SECONDS,HUNGTIME
054160  004737  072154          2$:             CALL      QUE
054164                                          ON.ERROR
054166  010037  002056                            MOV     R0,BAD
054172  104060                                    ERROR   +60               ;SLAVE HUNG SYSTEM!
054174                                            $RETURN ERROR
054200                                          END ;OF ON.ERROR
054200  005761  002616                          TST       TASK(R1)
054204  100365                                  BPL       2$
054206                                        END ;OF FOR R0
054216  005000                                ;I ASSUME THEY HAVE FINISHED COMPLETELY AFTER THIS DELAY
                                              CLR R0
054220  077001          1$:                   SOB R0,1$
054222                                        FOR R2 := #FIRST TO #FIRST+34 BY #4
054226                                          FOR I := #1 TO #1000.
054234                                            SUPERVISOR                    ;ENTER SUPERVISOR MODE
054242  012712  000001                          MOV     #1,(R2)               ;UNLOCK TEST LOCATION
054246  004737  054544                          CALL    WAKEUP

                                                ;RECORD WINNER(S)
054252  005000                                  CLR     R0
054254                                          FOR R1 := #0 TO #6 BY #2
054256                                            IF SLFLAG(R1) IS TRUE
054264  005261  002646                              INC PORTCOUNT(R1)
054270  005200                                      INC R0
054272                                            END ;OF IF SLFLAG
054272                                          END ;OF FOR R1


                                                ;CHECK FOR ONE & ONLY ONE LOCK
054304                                          IF R0 NE #1
054312  104033                                    ERROR +33
```

```
    512 054314                                                  END ;OF IF R0
    513 054314                                                END ;OF FOR I
    514 054330                                              END ;OF FOR R2
    515 054342  104417                                      KERNEL
    516 054344  004737  054472                              CALL        M13BAL                  ;CALL BALANCE TEST
    517 054350                                            END ;OF IF PFLAG
    518 054350                                          END ;OF FOR BANK
    519 054364                                          FOR R0 := #1 TO SLAVES
    520 054370  010001                                    MOV   R0,R1
    521 054372  006301                                    ASL   R1
    522 054374  012761  000014  002616                    MOV   #14,TASK(R1)                    ;ORDERS TO RESET FROM ASRB TEST
    523 054402                                          END ;OF FOR R0
    524 054412                                          FOR R0 := #1 TO SLAVES
    525 054416  010001                                    MOV   R0,R1
    526 054420  006301                                    ASL   R1
    527 054422  012737  061165  002574                      MOV #5*SECONDS,HUNGTIME
    528 054430  004737  072154          3$:               CALL  QUE
    529 054434                                            ON.ERROR
    530 054436  010037  002056                              MOV R0,BAD
    531 054442  104060                                      ERROR       +60             ;SLAVE HUNG SYSTEM!
    532 054444                                              $RETURN     ERROR
    533 054450                                            END ;OF ON.ERROR
    534 054450  005761  002616                            TST   TASK(R1)                        ;WAIT FOR ALL CPU'S DONE
    535 054454  100365                                    BPL   3$
    536 054456                                          END ;OF FOR R0
    537 054466                                          $RETURN NOERROR
    538                                                 .DSABL  LSB
```

```
                                        M13BAL: SUBTST  <<BALANCE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        BALANCE TEST
                                        ;*****************************************************************************
                                                BEGIN ASRBALANCE
                                                FOR R0 := #0 TO SLAVES
054474  010001                                    MOV     R0,R1
054476  006301                                    ASL     R1
054500  013702  002646                            MOV     PORTCOUNT,R2
054504  166102  002646                            SUB     PORTCOUNT(R1),R2
054510  062702  000400                            ADD     #256.,R2                ;# HERE & IN NEXT INST IS + OR - COUNT SPEC
054514                                          IF R2 LT #0 OR R2 GT #256.*2
054526  104053                                      ERROR       +53
054530                                              LEAVE       ASRBALANCE
054532                                          END ;OF IF R2
054532                                          END ;OF FOR R0
054542                                          END ASRBALANCE
054542  000207                                  RETURN

                                                ;WAKE UP EVERY CPU
054544                                  WAKEUP: SET     FIRST+2
                                                ;INCLUDING MYSELF
054552  000240                                  NOP
054554  000240                                  NOP
054556  005000                                  CLR     R0
054560  017701  126156                          MOV     @IISTVEC,R1
054564  004711                                  CALL    (R1)
054566  000207                                  RETURN
```

```
                                        .SBTTL  ERROR DATA (SUPERVISOR) SETUP STUFF
054570                          $PER25: LET ADDRESS := R1 - #2
054602                                  IF ABORTFLAG IS FALSE
054610                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
054616                                    LET BAD := -2(R1)
054624  104417                            KERNEL                  ;ENTER KERNEL MODE
054626                                  END ;OF IF ABORTFLAG
054626                                  IF 177654 EQ #0
054634                                    LET GOOD :- R2
054640                                  ELSE
054642                                    LET GOOD := R3
054646                                  END ;OF IF
054646  000137  065330                  JMP     PERRAW

054652                          PERRA3: SUBTST  <<DATA WAS 3 WORDS>>
                                ;*************************************************************************
                                ;*SUBTEST       DATA WAS 3 WORDS
                                ;*************************************************************************
054652                                  IF BADPC EQ #0 THEN $CALL BADSTACK
054664                                  PUSH    R0
054666  104505                          CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
054670  104426                          READCSR
054672  013700  002144                  MOV     CSR,R0
054676  000300                          SWAB    R0
054700  042700  177600                  BIC     #^C177,R0
054704  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
054706                                  LET ADDRESS := R1
054712  005037  002050                  CLR     GOOD
054716                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
054724  011137  002056                  MOV     (R1),BAD
054730  016137  000002  002060          MOV     2(R1),BAD2
054736  104417                          KERNEL                  ;ENTER KERNEL MODE
054740  110037  002062                  MOVB    R0,BAD3
054744  105037  002063                  CLRB    BAD3+1
054750  004737  065564                  CALL    PERBNK
054754  104034                          ERROR   +34
054756                                  POP     R0
054760  000002                          RTI
```

```
    605 054762                          $PER30: LET GOOD :  R1
    606 054766                                  LET ADDRESS :  (SP) - 10
    607 055000                                  IF ABORTFLAG IS FALSE
    608 055006                                    SUPERVISOR            ;ENTER SUPERVISOR MODE
    609 055014                                    LET BAD := @ADDRESS
    610 055022  104417                            KERNEL                ;ENTER KERNEL MODE
    611 055024                                  END ;OF IF ABORTFLAG
    612 055024  000137  065330                  JMP PERRAW
    613
    614 055030                          GETDATA:SUBTST  <<GET DATA FROM ABORTED AREA IF POSSIBLE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       GET DATA FROM ABORTED AREA IF POSSIBLE
                                        ;*****************************************************************************
    615 055030                                  PUSH    R0,4,114
    616 055042  010637  055156                  MOV     SP,GETDA1
    617 055046  012737  055122  000004          MOV     #1$,4
    618 055054  012737  055122  000114          MOV     #1$,114
    619 055062  013700  002040                  MOV     ADDRESS,R0
    620 055066  052737  000001  177750          BIS     #BIT0,MAINT
    621 055074  052737  004000  177746          BIS     #BIT11,CONTRL         ;DISABLE ABORTS
    622 055102                                  SUPERVISOR
    623 055110  011037  002056                  MOV     (R0),BAD
    624 055114  104417                          KERNEL
    625 055116  005037  002142                  CLR     ABORTFLAG
    626 055122  013706  055156          1$:     MOV     GETDA1,SP             ;RESTORE KNOWN GOOD STACK POINTER
    627 055126  042737  004000  177746          BIC     #BIT11,CONTRL         ;ENABLE ABORTS
    628 055134  042737  000001  177750          BIC     #BIT0,MAINT
    629 055142                                  POP     114,4,R0
    630 055154  000207                          RETURN
    631 055156  000000                  GETDA1: 0
```

```
                                        .SBTTL  POWER FAIL AUTO RESTART
                                        .SBTTL  ROUTINE POWER DOWN AND UP
                                ;***************************************************************************
                                ;POWER DOWN ROUTINE
055160                          $PWRDN: IF CPUBIT NE #MASTER
055170  000000                  DNSLAV:   HALT
055172  000776                          BR      DNSLAV
055174                                  END ;OF IF CPUBIT
055174  012737  000376  002760          MOV     #376,PWLOCK
                                        ;SAVE CACHE & MARGIN STATUS
055202                                  PUSH    CONTRL,MAINT
055212  104423                          CACHON                  ;TURN CACHE ON
055214  012737  056134  000024          MOV     #$ILLUP,PWRVEC ;;SET FOR FAST UP
055222  012737  000340  000026          MOV     #340,PWRVEC+2   ;;PRIO:7
055230                                  PUSH    R0,R1,R2,R3,R4,R5,CSRNO
                                        ;SAVE USER PAR'S & PDR7
055250  012700  177700                  MOV     #177700,R0
055254  012701  000021                  MOV     #17.,R1
055260                          1$:     PUSH    -(R0)
055262  077102                          SOB     R1,1$
                                        ;SAVE SUPERVISOR PAR'S
055264  012700  172300                  MOV     #172300,R0
055270  012701  000020                  MOV     #16.,R1
055274                          2$:     PUSH    -(R0)
055276  077102                          SOB     R1,2$
055300                                  IF RLFLAG IS TRUE THEN $CALL WOOPS
                                        ;COPY KERNEL MAP TO USER & SUPERVISOR
055312  012700  172300                  MOV     #KIPDR0,R0
055316  012701  177600                  MOV     #UIPDR0,R1
055322  012702  172200                  MOV     #SIPDR0,R2
055326  012703  000040                  MOV     #32.,R3
055332  011021                  3$:     MOV     (R0),(R1)+
055334  012022                          MOV     (R0)+,(R2)+
055336  077303                          SOB     R3,3$
```

```
    669                                         ;SAVE USER & SUPERVISOR STACK POINTERS
    670 055340                                  USER
    671 055346  010600                          MOV     USP,R0
    672 055350  104417                          KERNEL                  ;ENTER KERNEL MODE
    673 055352                                  PUSH    R0
    674 055354                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
    675 055362  010600                          MOV     SSP,R0
    676 055364  104417                          KERNEL                  ;ENTER KERNEL MODE
    677 055366                                  PUSH    R0
    678                                         ;SAVE MK11 REGISTERS
    679 055370  013701  002334                  MOV     MKCSRS,R1       ;GET CSR'S BYTE
    680 055374                                  BEGIN LCSRSAVE
    681 055374                                    FOR CSRNO := #0 TO #34 BY #4
    682 055400  106301                              ASLB        R1
    683 055402                                      ON.ERROR
    684 055404  104426                                READCSR
    685 055406                                        PUSH      CSR,CSR+2
    686 055416                                      END ;OF ON.ERROR
    687 055416                                      IFB R1 EQ #0 THEN LEAVE LCSRSAVE
    688 055422                                    END ;OF FOR CSRNO
    689 055440                                  END LCSRSAVE
    690                                         ;SAVE MMR0,1,2,3
    691 055440                                  PUSH    MMR0,MMR1,MMR2,MMR3
    692                                         ;SAVE KERNEL PAR'S
    693 055460  012700  172400                  MOV     #172400,R0
    694 055464  012701  000020                  MOV     #16.,R1
    695 055470                          4$:     PUSH    -(R0)
    696 055472  077102                          SOB     R1,4$
    697                                         ;SAVE UNIBUS MAP REGISTERS
    698 055474                                  PUSH    MAPH36,MAPL36,MAPH0,MAPL0
    699                                         ;SAVE POSSIBLE SOFTWARE SWITCH REGISTER
    700 055514                                  PUSH    @SWR
    701                                         ;SAVE STACK POINTER
    702 055520  010637  056140                  MOV     SP,$SAVR6       ;;SAVE SP
    703                                         ;NOW SET UP REAL VECTOR
    704 055524  012737  055536  000024          MOV     #$PWRUP,PWRVEC  ;;SET UP VECTOR
    705 055532  000000                  $DOWN:  HALT
    706 055534  000776                          BR      $DOWN           ;;HANG UP
```

```
                                        ;*********************************************************************
                                        ;POWER UP ROUTINE
055536                                  $PWRUP: IF MULTIPORT IS TRUE THEN JUMPTO MULTIUP
055550  012737  056134  000024                  MOV     #$ILLUP,PWRVEC ;;SET FOR FAST DOWN
                                                ;RESTORE STACK POINTER
055556  013706  056140                          MOV     $SAVR6,SP       ;;GET SP
055562  005037  056140                          CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
055566  005237  056140          1$:             INC     $SAVR6          ;;WAIT FOR THE INC
055572  001375                                  BNE     1$              ;;OF A WORD
                                                ;RESTORE POSSIBLE SOFTWARE SWITCH REGISTER
055574                                          POP     @SWR
                                                ;RESTORE UNIBUS MAP
055600                                          POP     MAPL0,MAPH0,MAPL36,MAPH36
055620  004737  042026                          CAL_    LOWMAP          ;SETUP LOWER 16K OF UNIBUS MAP
                                                ;RESTORE KERNEL PAR'S & PDR'S
055624  012700  172340                          MOV     #172340,R0
055630  012702  172300                          MOV     #KIPDR0,R2
055634  012701  000020                          MOV     #16.,R1
055640                                  6$:     POP     (R0)+
055642  012722  077406                          MOV     #77406,(R2)+
055646  077104                                  SOB     R1,6$
                                                ;RESTORE MMR3,2,1,0
055650                                          POP     MMR3,MMR2,MMR1,MMR0
                                                ;RESTORE MK11 REGISTERS
055670  013701  002334                          MOV     MKCSRS,R1       ;GET CSR'S BYTE
055674  042701  177400                          BIC     #177400,R1
055700                                          BEGIN LCSRRESTORE
055700                                            FOR CSRNO := #34 DOWNTO #0 BY #4
055706  106201                                      ASRB        R1
055710                                              ON.ERROR
055712                                                POP       CSR+2,CSR
055722  104425                                        LOADCSR
055724                                              END ;OF ON.ERROR
055724                                              IFB R1 EQ #0 THEN LEAVE LCSRRESTORE
055730                                            END ;OF FOR CSRNO
055746                                          END LCSRRESTORE
                                                ;COPY KERNEL MAP TO USER & SUPERVISOR
055746  012700  172300                          MOV     #KIPDR0,R0
055752  012701  177600                          MOV     #UIPDR0,R1
055756  012702  172200                          MOV     #SIPDR0,R2
055762  012703  000040                          MOV     #32.,R3
055766  011021                          3$:     MOV     (R0),(R1)+
055770  012022                                  MOV     (R0)+,(R2)+
055772  077303                                  SOB     R3,3$
```

```
                                        ;RESTORE SUPERVISOR & USER STACK POINTERS
055774                                  POP     R0
055776                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
056004  010006                          MOV     R0,SSP
056006  104417                          KERNEL                  ;ENTER KERNEL MODE
056010                                  POP     R0
056012                                  USER
056020  010006                          MOV     R0,USP
056022  104417                          KERNEL                  ;ENTER KERNEL MODE
                                        ;RESTORE SUPERVISOR PAR'S
056024  012700  172240                  MOV     #172240,R0
056030  012701  000020                  MOV     #16.,R1
056034                          7$:     POP     (R0)+
056036  077102                          SOB     R1,7$
                                        ;RESTORE USER PAR'S & PDR7
056040  012700  177636                  MOV     #177636,R0
056044  012701  000021                  MOV     #17.,R1
056050                          8$:     POP     (R0)+
056052  077102                          SOB     R1,8$
                                        ;RESTORE POSSIBLE SOFTWARE DISPLAY REGISTER
056054  013777  002014  124706          MOV     $PATMAR,@DISPLAY
056062  013737  002014  000174          MOV     $PATMAR,DISPREG
056070                                  POP     CSRNO,R5,R4,R3,R2,R1,R0
056110  012737  055160  000024          MOV     #$PWRDN,PWRVEC  ;;SET UP THE POWER DOWN VECTOR
056116                                  TYPE    MSG051          ;REPORT THE POWER FAILURE
                                        ;RESTORE MARGIN & CACHE STATUS
056122                                  POP     MAINT,CONTRL
056132  000002                          RTI
056134  000000                  $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
056136  000776                          BR      $ILLUP          ;; BEFORE THE POWER DOWN WAS COMPLETE
056140  000000                  $SAVR6: 0                       ;;PUT THE SP HERE
                                        .EVEN
```

```
                                MULTIUP:SUBTST  <<MULTIPLE CPU'S POWERING UP>>
                                ;*****************************************************************************
                                ;*SUBTEST        MULTIPLE CPU'S POWERING UP
                                ;*****************************************************************************
056142  106237  002760                ASRB    PWLOCK
056146  103002                        BCC     UP2
056150  000000                MULHLT: HALT                    ;BECAUSE I'VE BEEN LOCKED OUT
056152  000776                        BR      MULHLT
056154  000137  004352          UP2:  JMP     START

056160                          WOOPS:  SUBTST  <<POWER FAIL WHILE RELOCATED>>
                                ;*****************************************************************************
                                ;*SUBTEST        POWER FAIL WHILE RELOCATED
                                ;*****************************************************************************
056160                                  PUSH    BANK
056164  005037  002106                  CLR     BANK
056170                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
056204                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
056212  013737  060024  056542          MOV     FIRST+PWRVEC,WOOPSAV
056220  013737  060026  056544          MOV     FIRST+PWRVEC+2,WOOPSAV+2
056226                                  BMOV    FIRST+WOOPUP,WOOPSAV+4,WOOPEND-WOOPUP/2+12.
056240  012737  056336  060024          MOV     #WOOPUP,FIRST+PWRVEC
056246  012737  000340  060026          MOV     #340,FIRST+PWRVEC+2
056254                                  BMOV    WOOPUP,FIRST+WOOPUP,WOOPEND-WOOPUP/2
056266  012700  172340                  MOV     #KIPAR0,R0
056272  012701  136512                  MOV     #FIRST+WOOPEND,R1
056276  012702  000010                  MOV     #8.,R2
056302  012021                  1$:     MOV     (R0)+,(R1)+
056304  077202                          SOB     R2,1$
056306  013721  172516                  MOV     MMR3,(R1)+
056312  013721  177576                  MOV     MMR2,(R1)+
056316  013721  177574                  MOV     MMR1,(R1)+
056322  013721  177572                  MOV     MMR0,(R1)+
056326  104417                          KERNEL                  ;ENTER KERNEL MODE
056330                                  POP     BANK
056334  000207                          RETURN
```

```
    820 056336                          WOOPUP: SUBTST  <<POWER UP FROM BANK 0 TO RELOCATION>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       POWER UP FROM BANK 0 TO RELOCATION
                                        ;*****************************************************************************
    821 056336  012700  056512                  MOV     #WOOPEND,R0
    822 056342  012701  172340                  MOV     #KIPAR0,R1
    823 056346  012703  172300                  MOV     #KIPDR0,R3
    824 056352  012702  000010                  MOV     #8.,R2
    825 056356  012021                  1$.     MOV     (R0)+,(R1)+
    826 056360  012723  077406                  MOV     #77406,(R3)+
    827 056364  077204                          SOB     R2,1$
    828 056366  012037  172516                  MOV     (R0)+,MMR3
    829 056372  012037  177576                  MOV     (R0)+,MMR2
    830 056376  012037  177574                  MOV     (R0)+,MMR1
    831 056402  012037  177572                  MOV     (R0)+,MMR0
    832 056406  013706  056140                  MOV     $SAVR6,SP
    833 056412                                  PUSH    BANK
    834 056416  005037  002106                  CLR     BANK
    835 056422                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
    836 056436                                  SUPERVISOR                      ;ENTER SUPERVISOR MODE
    837 056444  013737  056542  060024          MOV     WOOPSAV,FIRST+PWRVEC
    838 056452  013737  056544  060026          MOV     WOOPSAV+2,FIRST+PWRVEC+2
    839                                         ;SIMULATE THE FOLLOWING BLOCK MOV BUT WITH NO STACK ACCESSES
    840                                         ;BMOV   WOOPSAV+4,FIRST+WOOPUP,WOOPEND-WOOPUP/2+12.
    841 056460  012700  056546                  MOV     #WOOPSAV+4,R0
    842 056464  012701  000102                  MOV     #WOOPEND-WOOPUP/2+12.,R1
    843 056470  012702  136336                  MOV     #FIRST+WOOPUP,R2
    844 056474  012022                  2$:     MOV     (R0)+,(R2)+
    845 056476  077102                          SOB     R1,2$
    846
    847 056500  104417                          KERNEL                          ;ENTER KERNEL MODE
    848 056502                                  POP     BANK
    849 056506  000137  055536                  JMP     $PWRUP
    850 056512  000014          WOOPEND:.REPT   12.
    853 056542  000104          WOOPSAV:.REPT   WOOPEND-WOOPUP/2+12.+2
```

```
                                        .SBTTL  IO SUBROUTINES
                                        .SBTTL  ROUTINE TYPE
                                ;*******************************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*       TYPE    MESADR          ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*       TYPE
                                ;*       MESADR
                                ;*
056752  105737  002452  $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
056756  100407                  BMI     6$              ;BR IF NO
056760  010046          1$:     MOV     R0,-(SP)        ;;SAVE R0
056762  017600  000002          MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
056766  112046          4$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
056770  001005                  BNE     7$              ;;BR IF IT ISN'T THE TERMINATOR
056772  005726                  TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
056774  012600          5$:     MOV     (SP)+,R0        ;;RESTORE R0
056776  062716  000002  6$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
057002  000002                  RTI                     ;;RETURN
057004  122716  000011  7$:     CMPB    #HT,(SP)        ;BRANCH IF NOT <HT>
057010  001002                  BNE     11$
057012  112716  000040          MOVB    #' ,(SP)        ;REPLACE TAB WITH SPACE
057016  122716  000200  11$:    CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
057022  001006                  BNE     8$
057024  005726                  TST     (SP)+           ;;POP  <CR><LF> EQUIV
057026                          TYPE                    ;;TYPE A CR AND LF
057030  003010                  $CRLF
057032  105037  057356          CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
057036  000753                  BR      4$              ;;GET NEXT CHARACTER
057040  004737  057076  8$:     CALL    $TYPEC          ;;GO TYPE THIS CHARACTER
057044  123726  003002  9$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
057050  001346                  BNE     4$              ;;IF NO GO GET NEXT CHAR.
057052  013746  002450          MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                        ;;AND THE NULL CHAR.
057056  105366  000001  10$:    DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
057062  002770                  BLT     9$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
057064  004737  057076          CALL    $TYPEC          ;;GO TYPE A NULL
057070  105337  057356          DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
057074  000770                  BR      10$             ;;LOOP
057076                  $TYPEC: PUSH    R1
057100  116601  000004          MOVB    4(SP),R1
057104                          PUSH    R0,CONTRL
057112  104424                  CACHOFF                 ;TURN CACHE OFF
057114                          IF MULTIPORT IS TRUE
057122                            IF NOIIST IS TRUE
057130  013700  177764              MOV SYSTID,R0
057134                            ELSE
```

```
    915 057136  017700  123574                      MOV @IISTACR,R0
    916 057142  072027  177770                      ASH #-8.,R0
    917 057146  042700  177774                      BIC #^C3,R0
    918 057152                                    END ;OF IF NOIIST
    919 057152                                  END ;OF IF MULTIPORT
    920 057152                                  IF PORTDIR NE R0 AND MULTIPORT IS TRUE  ;IF I,M NOT THE MASTER IN A MULTIPORT SYSTEM
    921 057166                                    IF CPUBIT EQ #SLAVE1 THEN LET R0 := #2
    922 057202                                    IF CPUBIT EQ #SLAVE2 THEN LET R0 := #4
    923 057216                                    IF CPUBIT EQ #SLAVE3 THEN LET R0 := #6
    924 057232                                    MAP   #0                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
    925 057246                                    SUPERVISOR                ;ENTER SUPERVISOR MODE
    926 057254  005760  062626          2$:       TST   FIRST+PTYFLAG(R0)
    927 057260  100775                            BMI   2$
    928 057262  110160  062636                    MOVB  R1,FIRST+PTYBUF(R0)
    929 057266                                    SET   FIRST+PTYFLAG(R0)
    930 057274                                    MAP   BANK                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
    931 057310  104417                            KERNEL                          ;ENTER KERNEL MODE
    932 057312                                  ELSE                        ;IF I AM THE MASTER OR WE'RE NOT MULTIPORTING
    933 057314  105777  123456          3$:       TSTB  @$TPS               ;;WAIT UNTIL PRINTER IS READY
    934 057320  100375                            BPL   3$
    935 057322  110177  123452                    MOVB  R1,@$TPB            ;;LOAD CHAR TO BE TYPED INTO DATA REG.
    936 057326                                  END ;OF IF PORTDIR
    937 057326  122766  000015  000002          CMPB  #CR,2(SP)           ;;IS CHARACTER A CARRIAGE RETURN?
    938 057334  001003                          BNE   1$                  ;;BRANCH IF NO
    939 057336  105037  057356                  CLRB  $CHARCNT            ;;YES--CLEAR CHARACTER COUNT
    940 057342  000406                          BR    $TYPEX              ;;EXIT
    941 057344  122766  000012  000002  1$:     CMPB  #LF,2(SP)           ;;IS CHARACTER A LINE FEED?
    942 057352  001402                          BEQ   $TYPEX              ;;BRANCH IF YES
    943 057354  105227                          INCB  (PC)+               ;;COUNT THE CHARACTER
    944 057356  000000          $CHARCNT:.WORD  0                         ;;CHARACTER COUNT STORAGE
    945 057360                  $TYPEX: POP     CONTRL,R0,R1
    946 057370  000207                          RETURN
    947 057372                  SUPLIMIT:;!.!!.!!!.!!!THIS IS THE LIMIT ON SUPERVISOR MAPPED TO MUT SPACE
```

```
  949 057372                            MAST01: SUBTST  <<MULTIPORT SLAVE STARTER>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MULTIPORT SLAVE STARTER
                                        ;*****************************************************************************
  950                                           .ENABL  LSB
  951 057372  104424                            CACHOFF                         ;TURN CACHE OFF
  952 057374                                    SET     NOSCOPE                 ;NO SCOPE LOOPS IN MULTIPROCESSOR TESTS
  953 057402  012737  177777  002676            MOV     #-1,MDISPLAY
  954 057410  013777  002676  123352            MOV     MDISPLAY,@DISPLAY
  955                                           ;PASS PSEUDO SWR TO SLAVE
  956 057416  013737  002766  002674            MOV     SWR,MASWR               ;SAVE REAL SWR
  957 057424  012737  000176  002766            MOV     #SWREG,SWR              ;SETUP SOFTWARE SWR
  958 057432  017777  123236  123326            MOV     @MASWR,@SWR             ;FILL IT WITH REAL SWR STUFF
  959 057440                                    IF NOIIST IS TRUE
  960 057446                                      FOR R0 := #1 TO SLAVES
  961 057452  005037  002670                        CLR LOCK
  962 057456  162737  000200  002706                SUB #200,KSTACK
  963 057464  010001                                MOV R0,R1
  964 057466  006301                                ASL R1
  965 057470                                        FOR R2 := #10. DOWNTO #0
  966 057474  010261  002636                          MOV     R2,PTYBUF(R1)
  967 057500  012703  000200                          MOV     #200,R3 ;DELAY FOR THE SLAVE TO GAIN ACCES  TO CNT-DOWN
  968 057504  077301                    1$:           SOB     R3,1$
  969 057506                                        END ;OF FOR R2
  970 057516  012703  000200                        MOV #200,R3 ;DELAY FOR THE SLAVE TO SETUP HIS STACK
  971 057522  077301                    2$:         SOB R3,2$
  972 057524  012737  023542  002574              MOV #2*SECONDS,HUNGTIME
  973 057532  004737  072154            4$:       CALL        QUE
  974 057536                                      ON.ERROR
  975 057540  010037  002056                        MOV     R0,BAD
  976 057544  104060                                ERROR   +60                 ;SLAVE HUNG SYSTEM.
  977 057546  005037  003014                        CLR     MULTIPORT
  978 057552  012737  002000  002706                MOV     #STACK,KSTACK
  979 057560  000137  060746                        JMP     MULTIEXIT
  980 057564                                      END ;OF ON.ERROR
  981 057564  005761  002616                      TST TASK(R1)
  982 057570  100360                              BPL 4$
  983 057572                                    END ;OF FOR R0
  984 057602                                  ELSE
  985 057604  013700  002742                    MOV   IISTVEC,R0
  986 057610  012720  061216                    MOV   #SLAVUP,(R0)+
  987 057614  012710  000340                    MOV   #340,(R0)
  988 057620                                    FOR R0 := #0 TO #3
  989 057622  005037  002670                      CLR LOCK
  990 057626  162737  000200  002706              SUB #200,KSTACK
  991 057634  012701  000001                      MOV #1,R1
  992 057640  072100                              ASH R0,R1
  993 057642  004737  061174                      CALL        IISTOFF         ;INIT IIST & DISABLE BOOTS & INTERRUPTS
  994 057646  012777  000000  123062              MOV #0,@IISTACR
  995 057654  010177  123060                      MOV R1,@IISTADR     ;INTERRUPT SOME CPU
  996 057660  012777  000001  123052              MOV #1,@IISTADR     ;NOW!
  997
  998                                           ;WAIT FOR READY FLAG
  999 057666  012737  061165  002574            MOV #5*SECONDS,HUNGTIME
 1000 057674  012777  000001  123034  6$:       MOV #1,@IISTACR
 1001 057702                                    ON.ERROR
 1002 057704  104061                              ERROR     +61               ;IIST HUNG SYSTEM.
```

```
1003 057706  005037  003014                        CLR       MULTIPORT
1004 057712  012737  002000  002706                MOV       #STACK,KSTACK
1005 057720  000137  060746                        JMP       MULTIEXIT
1006 057724                                      END ;OF ON.ERROR
1007 057724  032777  004000  123006              BIT #BIT11,@IISTADR
1008 057732  001760                             BEQ 6$
1009 057734  012703  000200                     MOV #200,R3 ;DELAY FOR THE IIST TO REALLY BE READY
1010 057740  077301                     3$:     SOB R3,3$   ;AND FOR SLAVE TO GO THRU VECTOR AND SETUP HIS STACK
1011 057742                                    END ;OF FOR R0
1012 057752                                    FOR R0 := #1 TO SLAVES
1013 057756  010001                              MOV R0,R1
1014 057760  006301                              ASL R1
1015 057762  012737  061165  002574              MOV #5*SECONDS,HUNGTIME
1016 057770  004737  072154              5$:     CALL      QUE
1017 057774                                      ON.ERROR
1018 057776  010037  002056                        MOV       R0,BAD
1019 060002  104060                                ERROR     +60             ;SLAVE HUNG SYSTEM.
1020 060004  005037  003014                        CLR       MULTIPORT
1021 060010  012737  002000  002706                MOV       #STACK,KSTACK
1022 060016  000137  060746                        JMP       MULTIEXIT
1023 060022                                      END ;OF ON.ERROR
1024 060022  005761  002616                      TST TASK(R1)
1025 060026  100360                             BPL 5$
1026 060030                                    END ;OF FOR R0
1027 060040                                  END ;OF IF NOIIST
1028 060040  012737  002000  002706            MOV     #STACK,KSTACK
1029                                          .DSABL  LSB
```

```
                                        MAST02: SUBTST  <<HAVE SLAVES RUN CSR TESTS>>
                                        ;*********************************************************************
                                        ;*SUBTEST        HAVE SLAVES RUN CSR TESTS
                                        ;*********************************************************************
                                                .ENABL  LSB
060046  012737  000000  002676                  MOV     #0,@DISPLAY     ;LET SLAVES SHOW INDIVIDUAL CSR TESTS IN DISPLAY
060054  012777  177776  122706                  MOV     #-2,@DISPLAY    ;FAKE OUT MASTER'S DISPLAY (NOT SLAVES)
060062  005037  002670                          CLR     LOCK
060066                                          FOR R0 := #1 TO SLAVES
060072  012701  000020                            MOV   #BIT4,R1
060076  072100                                    ASH   R0,R1
060100  010137  002114                            MOV   R1,CPUBIT
060104  010001                                    MOV   R0,R1
060106  006301                                    ASL   R1
060110  012761  000015  002616                    MOV   #15,TASK(R1)              ;RUN CSR TESTS COMMAND
060116  012737  000031  002572                    MOV   #25.,HUNGMSB
060124  012737  177777  002574                    MOV   #-1,HUNGTIME              ;13 SECONDS
060132  004737  072154            1$:             CALL  QUE
060136                                            ON.ERROR
060140  162737  000001  002572                      SUB #1,HUNGMSB
060146                                              ON.ERROR
060150  010037  002056                                MOV       R0,BAD
060154  012737  000020  002114                        MOV       #MASTER,CPUBIT
060162  104060                                        ERROR     +60               ;SLAVE HUNG SYSTEM!
060164  005037  003014                                CLR       @MULTIPORT
060170  000137  060746                                JMP       @MULTIEXIT
060174                                              END ;OF ON.ERROR
060174                                            END ;OF ON.ERROR
060174  005761  002616                            TST   TASK(R1)
060200  100354                                    BPL   1$
060202                                          END ;OF FOR R0
060212  012737  000020  002114                  MOV     #MASTER,CPUBIT          ;SET UP AS MASTER AGAIN
                                                .DSABL  LSB
```

```
1064 060220                                MAST03: SUBTST  <<MOVE SLAVES TO THERE OWN BANKS>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MOVE SLAVES TO THERE OWN BANKS
                                           ;*****************************************************************************
1065
1066 060220  012737  177775  002676                .ENABL  LSB
1067 060226  013777  002676  122534                MOV     #-3,@DISPLAY
1068 060234  005037  002670                        MOV     @DISPLAY,LOCK
1069 060240                                        CLR     LOCK
1070 060244  012701  000020                        FOR R0 := #1 TO SLAVES
1071 060250  072100                                  MOV   #BIT4,R1
1072 060252  010137  002114                          ASH   R0,R1
1073 060256                                          MOV   R1,CPUBIT
1074 060256                                          BEGIN MOVELOOP
1075 060264  004737  042422                            FOR BANK := #1 TO #167
1076 060270                                              CALL EXBANK
1077 060312  104511                                      IF PFLAG IS FALSE AND ACFLAG IS TRUE AND BMFLAG IS FALSE
1078 060314  010001                                        INVALIDATE
1079 060316  006301                                        MOV     R0,R1
1080 060320  012761  000001  002616                       ASL     R1              ;R1 = 2 OR 4 OR 6
1081 060326  012737  061165  002574                       MOV     #1,TASK(R1)     ;MOVE COMMAND
1082 060334  004737  072154          1$:                  MOV     #5*SECONDS,HUNGTIME
1083 060340                                               CALL    QUE
1084 060342  010037  002056                               ON.ERROR
1085 060346  012737  000020  002114                         MOV   R0,BAD
1086 060354  104060                                        MOV   #MASTER,CPUBIT
1087 060356  005037  003014                                ERROR +60               ;SLAVE HUNG SYSTEM
1088 060362  000137  060746                                CLR   MULTIPORT
1089 060366                                                JMP   MULTIEXIT
1090 060366  005761  002616                               END ;OF ON.ERROR
1091 060372  100360                                       TST     TASK(R1)
1092 060374  013701  002110                               BPL     1$
1093 060400  052761  100000  003016                       MOV     BANKINDEX,R1
1094 060406  042761  020000  003020                       BIS     #BIT15,CONFIG(R1)
1095 060414                                               BIC     #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
1096 060416                                               LEAVE MOVELOOP
1097 060416                                             END ;OF IF PFLAG
1098 060432  010037  002056                           END ;OF FOR BANK
1099 060436  104062                                   MOV R0,BAD
1100                                                   ERROR         +62               ;NOT ENOUGH GOOD MEMORY TO TEST SLAVES
1101 060440  005037  003014                                                           ;ABORTING MULTIPROCESSOR TESTS
1102 060444  000137  060746                           CLR MULTIPORT
1103 060450                                           JMP MULTIEXIT
1104 060450                                         END MOVELOOP
1105 060460  012737  002000  002706                 END ;OF FOR R0
1106                                                 MOV     #STACK,KSTACK
1107 060466  013737  002674  002766                 ;POINT THE MASTER BACK TO THE NORMAL SWR
1108                                                 MOV     MASWR,SWR
                                                     .DSABL  LSB
```

```
1111 060474                                    SUBTST  <<RUN NORMAL MULTIPROCESSOR TESTS>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       RUN NORMAL MULTIPROCESSOR TESTS
                                       ;*****************************************************************************
1112 060474  012737  000020  002114           MOV     #MASTER,CPUBIT
1113 060502  052737  000020  002510           BIS     #BIT4,ALLCPUS
1114 060510                                    FOR R0 :- #1 TO SLAVES
1115 060514  006337  002510                      ASL   ALLCPUS
1116 060520  052737  000020  002510              BIS   #BIT4,ALLCPUS
1117 060526                                    END ;OF FOR R0
1118 060536  004737  061322                    CALL    MAST04          ;ACCESS PATHS TEST
1119 060542                                    ON.ERROR
1120 060544  005037  003014                      CLR   MULTIPORT
1121 060550  000137  060746                      JMP   MULTIEXIT
1122 060554                                    END ;OF ON.ERROR
1123 060554  004737  061706                    CALL    MAST05          ;ADDRESS TEST
1124 060560                                    ON.ERROR
1125 060562  005037  003014                      CLR   MULTIPORT
1126 060566  000137  060746                      JMP   MULTIEXIT
1127 060572                                    END ;OF ON.ERROR
1128 060572  004737  062270                    CALL    MAST06          ;ASYCHRONOUS ADDRESS UNIQUENESS TEST
1129 060576                                    ON.ERROR
1130 060600  005037  003014                      CLR   MULTIPORT
1131 060604  000137  060746                      JMP   MULTIEXIT
1132 060610                                    END ;OF ON.ERROR
1133 060610  004737  062550                    CALL    MAST07          ;SKEWED UP ADDRESS TEST
1134 060614                                    ON.ERROR
1135 060616  005037  003014                      CLR   MULTIPORT
1136 060622  000137  060746                      JMP   MULTIEXIT
1137 060626                                    END ;OF ON.ERROR
1138 060626  004737  062776                    CALL    MAST10          ;PORT ARBITRATION SYMMETRY TEST
1139 060632                                    ON.ERROR
1140 060634  005037  003014                      CLR   MULTIPORT
1141 060640  000137  060746                      JMP   MULTIEXIT
1142 060644                                    END ;OF ON.ERROR
1143 060644  004737  063260                    CALL    MAST11          ;I/O PRIORITY TEST
1144 060650                                    ON.ERROR
1145 060652  005037  003014                      CLR   MULTIPORT
1146 060656  000137  060746                      JMP   MULTIEXIT
1147 060662                                    END ;OF ON.ERROR
1148 060662  004737  063732                    CALL    MAST12          ;EXECUTION CONTENTION TEST
1149 060666                                    ON.ERROR
1150 060670  005037  003014                      CLR   MULTIPORT
1151 060674  000137  060746                      JMP   MULTIEXIT
1152 060700                                    END ;OF ON.ERROR
1153 060700  004737  064200                    CALL    MAST13          ;ASRB TEST
1154 060704                                    ON.ERROR
1155 060706  005037  003014                      CLR   MULTIPORT
1156 060712  000137  060746                      JMP   MULTIEXIT
1157 060716                                    END ;OF ON.ERROR
1158 060716  004737  064204                    CALL    MAST14          ;CACHE FLUSH TEST
1159 060722                                    ON.ERROR
1160 060724  005037  003014                      CLR   MULTIPORT
1161 060730  000137  060746                      JMP   MULTIEXIT
1162 060734                                    END ;OF ON.ERROR
1163 060734  004737  064472                    CALL    MAST15          ;STOP SLAVES
1164 060740                                    ON.ERROR
```

RUN NORMAL MULTIPROCESSOR TESTS

```
1165 060742  005037  003014                    CLR    MULTIPORT
1166 060746                                   END ;OF ON.ERROR
1167 060746                          MULTIEXIT:FOR BANK := #1 TO #167
1168 060754  004737  042422                    CALL   EXBANK
1169 060760  013701  002110                    MOV    BANKINDEX,R1
1170 060764  042761  100000  003016            BIC    #BIT15,CONFIG(R1)
1171 060772                                   END ;OF FOR BANK
1172
1173                                          ;MARK THE LOADERS AS PROTECTED AGAIN
1174 061006  013737  002710  002706           MOV    LOADHOME,BANK
1175 061014  004737  042422                    CALL   EXBANK
1176 061020  013701  002110                    MOV    BANKINDEX,R1
1177 061024  052761  100000  003016            BIS    #BIT15,CONFIG(R1)
1178
1179 061032  005037  002676                    CLR    MDISPLAY
1180 061036  005077  121726                    CLR    @DISPLAY
1181 061042                                   SET    WRITEONLY
1182 061050  004737  015104                    CALL   DOBACK                    ;REWRITE BACKGROUND PATTERN
1183 061054                                   CLEAR  NOSCOPE,LOCK,WRITEONLY
1184 061070  000137  014656                    JMP    FLUSH
```

```
1187 061074                            IISTINIT:SUBTST <<INITIALIZE THE IIST>>
                                       ;*************************************************************************
                                       ;*SUBTEST       INITIALIZE THE IIST
                                       ;************************************************************************* *****
1188                                           .ENABL  LSB
1189 061074  012777  100000  121634            MOV     #BIT15,@IISTACR
1190 061102  012777  000005  121626            MOV     #5,@IISTACR
1191 061110  013777  002726  121622            MOV     ONES,@IISTADR
1192 061116  013777  002726  121614            MOV     ONES,@IISTADR
1193 061124  012737  061165  002574            MOV     #5*SECONDS,HUNGTIME
1194 061132  012777  000001  121576  2$:       MOV     #1,@IISTACR
1195 061140                                    IF CPUBIT EQ #MASTER
1196 061150                                      ON.ERROR
1197 061152  104061                                ERROR       +61                          ;IIST HUNG SYSTEM.
1198 061154  005037  003014                        CLR MULTIPORT
1199 061160  000207                                RETURN
1200 061162                                      END ;OF ON.ERROR
1201 061162                                    END ;OF IF CPUBIT
1202 061162  032777  004000  121550            BIT     #BIT11,@IISTADR
1203 061170  001760                            BEQ     2$
1204 061172  000207                            RETURN
1205                                           .DSABL  LSB
1206
1207 061174                            IISTOFF:SUBTST  <<INIT IIST & DISABLE BOOTS & INTERRUPTS>>
                                       ;*************************************************************************
                                       ;*SUBTEST       INIT IIST & DISABLE BOOTS & INTERRUPTS
                                       ;*************************************************************************
1208 061174  004737  061074                    CALL    IISTINIT
1209 061200  012777  000004  121530            MOV     #4,@IISTACR
1210 061206  013777  002726  121524            MOV     ONES,@IISTADR
1211 061214  000207                            RETURN
1212
1213 061216  013706  002706            SLAVUP: MOV     KSTACK,SP
1214 061222  004737  061244                    CALL    SLAVEMAP
1215 061226  104420                            ENERGIZE                ;TURN ON MEMORY MANAGEMENT
1216 061230  000237                            SPL     7
1217 061232  052763  100000  002616            BIS     #BIT15,TASK(R3)
1218 061240  000137  050726                    JMP     TASKDO
```

```
 1221 061244                            SLAVEMAP:SUBTST <<SLAVES MAP>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SLAVES MAP
                                        ;*****************************************************************************
 1222
 1223 061244  104415                            ;MAP KERNEL
                                                SAVREG
 1224 061246  012700  002550                    MOV     #KI0,R0
 1225 061252  012701  172340                    MOV     #KIPAR0,R1
 1226 061256  012702  077406                    MOV     #77406,R2
 1227 061262  012703  172300                    MOV     #KIPDR0,R3
 1228 061266  012705  000006                    MOV     #6,R5
 1229 061272  012021            1$:             MOV     (R0)+,(R1)+
 1230 061274  010223                            MOV     R2,(R3)+
 1231 061276  077503                            SOB     R5,1$
 1232 061300  012721  177400                    MOV     #177400,(R1)+
 1233 061304  010223                            MOV     R2,(R3)+
 1234 061306  012711  177600                    MOV     #177600,(R1)
 1235 061312  010213                            MOV     R2,(R3)
 1236 061314  104420                            ENERGIZE
 1237 061316  104416                            RESREG
 1238 061320  000207                            RETURN
```

```
1241 061322                            MAST04: SUBTST  <<MULTIPORT ACCESS PATHS TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MULTIPORT ACCESS PATHS TEST
                                       ;*****************************************************************************
1242                                           .ENABL  LSB
1243 061322  012737  177774  002676          MOV     #-4,@DISPLAY
1244 061330  013777  002676  121432          MOV     @DISPLAY,@DISPLAY
1245 061336                                    FOR R0 := #0 TO SLAVES
1246 061340  010001                              MOV   R0,R1
1247 061342  006301                              ASL   R1
1248 061344                                      FOR BANK := #1 TO #167
1249 061352  013737  002510  002114                MOV ALLCPUS,CPUBIT
1250 061360  004737  042422                        CALL        EXBANK
1251 061364  012737  000020  002114                MOV #MASTER,CPUBIT
1252 061372                                        IF PFLAG IS FALSE AND ACFLAG IS TRUE
1253 061406  104511                                  INVALIDATE
1254 061410                                          FOR R5 := #0 TO #5 ;FOR PATTERNS 0-5
1255 061412  010502                                    MOV     R5,R2
1256 061414  000302                                    SWAB    R2
1257 061416  062702  000002                            ADD     #2,R2           ;WRITE ONLY PATTERN COMMAND
1258 061422  010261  002616                            MOV     R2,TASK(R1)     ;SET TASK ORDER
1259 061426                                            IF R1 EQ #0
1260 061432                                              PUSH  R0,R1,R2,R5
1261 061442  004737  050726                              CALL  TASKDO
1262 061446                                              POP   R5,R2,R1,R0
1263 061456                                            END ;OF IF R1
1264 061456  012737  061165  002574                    MOV     #5*SECONDS,HUNGTIME
1265 061464  004737  072154          1$:               CALL    QUE
1266 061470                                            ON.ERROR
1267 061472  010037  002056                              MOV   R0,BAD
1268 061476  104060                                      ERROR +60                  ;SLAVE HUNG SYSTEM.
1269 061500                                              $RETURN ERROR
1270 061504                                            END ;OF ON.ERROR
1271 061504  005761  002616                            TST     TASK(R1)
1272 061510  100365                                    BPL     1$
1273 061512  062702  000001                            ADD     #1,R2           ;CHANGE ORDER TO READ ONLY
1274 061516                                            FOR R3 := #0 TO SLAVES
1275 061520  010304                                      MOV   R3,R4
1276 061522  006304                                      ASL   R4
1277 061524  010264  002616                              MOV   R2,TASK(R4)
1278 061530                                            END ;OF FOR R3
1279 061540                                            PUSH    R0,R1,R3,R4,R5
1280 061552  004737  050726                            CALL    TASKDO
1281 061556                                            POP     R5,R4,R3,R1,R0
1282 061570                                            FOR R3 := #0 TO SLAVES
1283 061572  010304                                      MOV   R3,R4
1284 061574  006304                                      ASL   R4
1285 061576                                              IF R4 NE R1
1286 061602  012737  061165  002574                        MOV #5*SECONDS,HUNGTIME
1287 061610  004737  072154          2$:                 CALL        QUE
1288 061614                                              ON.ERROR
1289 061616  010337  002056                                MOV       R3,BAD
1290 061622  104060                                        ERROR     +60           ;SLAVE HUNG SYSTEM.
1291 061624                                                $RETURN ERROR
1292 061630                                              END ;OF ON.ERROR
1293 061630  005764  002616                              TST TASK(R4)
1294 061634  100365                                      BPL 2$
```

```
1295 061636                                                    END ;OF IF R4
1296 061636                                                  END ;OF FOR R3
1297 061646                                                END ;OF FOR R5
1298 061656                                              END ;OF IF PFLAG
1299 061656                                            END ;OF FOR BANK
1300 061672                                          END ;OF FOR R0
1301 061702                                          $RETURN NOERROR
1302                                                 .DSABL  LSB
```

```
                                        MAST05: SUBTST  <<MULTIPORT ADDRESS TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MULTIPORT ADDRESS TEST
                                        ;*********************************************************************
1307                                            .ENABL  LSB
1308 061706  012737  177773  002676            MOV     #-5,MDISPLAY
1309 061714  013777  002676  121046            MOV     MDISPLAY,@DISPLAY
1310 061722                                     FOR R0 := #0 TO SLAVES
1311 061724  010001                               MOV   R0,R1
1312 061726  006301                               ASL   R1
1313 061730                                       FOR BANK := #1 TO #167
1314 061736  013737  002510  002114                 MOV ALLCPUS,CPUBIT
1315 061744  004737  042422                         CALL        EXBANK
1316 061750  012737  000020  002114                 MOV #MASTER,CPUBIT
1317 061756                                         IF PFLAG IS FALSE AND ACFLAG IS TRUE
1318 061772                                           FOR R5 := #0 TO #1 ;FOR ADDRESS & COMPLEMENT ADDRESS PATTERNS
1319 061774  010502                                     MOV     R5,R2
1320 061776  000302                                     SWAB    R2
1321 062000  062702  000007                           ADD     #7,R2             ;WRITE ONLY ADDRESS PATTERN
1322 062004  010261  002616                           MOV     R2,TASK(R1)       ;SET TASK ORDER
1323 062010                                           IF R1 EQ #0
1324 062014                                             PUSH  R0,R1,R2,R5
1325 062024  004737  050726                             CALL  TASKDO
1326 062030                                             POP   R5,R2,R1,R0
1327 062040                                           END ;OF IF R1
1328 062040  012737  061165  002574                   MOV     #5*SECONDS,HUNGTIME
1329 062046  004737  072154          1$:              CALL    QUE
1330 062052                                           ON.ERROR
1331 062054  010037  002056                             MOV   R0,BAD
1332 062060  104060                                     ERROR +60                 ;SLAVE HUNG SYSTEM
1333 062062                                             $RETURN ERROR
1334 062066                                           END ;OF ON.ERROR
1335 062066  005761  002616                           TST     TASK(R1)
1336 062072  100365                                   BPL     1$
1337 062074  062702  000001                           ADD     #1,R2             ;CHANGE ORDER TO READ ADDRESS PATTERNS ONLY
1338 062100                                           FOR R3 := #0 TO SLAVES
1339 062102  010304                                     MOV   R3,R4
1340 062104  006304                                     ASL   R4
1341 062106  010264  002616                             MOV   R2,TASK(R4)
1342 062112                                           END ;OF FOR R3
1343 062122                                           PUSH    R0,R1,R3,R4,R5
1344 062134  004737  050726                           CALL    TASKDO
1345 062140                                           POP     R5,R4,R3,R1,R0
1346 062152                                           FOR R3 := #0 TO SLAVES
1347 062154  010304                                     MOV   R3,R4
1348 062156  006304                                     ASL   R4
1349 062160                                             IF R4 NE R1
1350 062164  012737  061165  002574                       MOV #5*SECONDS,HUNGTIME
1351 062172  004737  072154          2$:                  CALL        QUE
1352 062176                                               ON.ERROR
1353 062200  010337  002056                                 MOV       R3,BAD
1354 062204  104060                                       ERROR     +60                   ;SLAVE HUNG SYSTEM.
1355 062206                                                $RETURN ERROR
1356 062212                                               END ;OF ON.ERROR
1357 062212  005764  002616                               TST TASK(R4)
1358 062216  100365                                       BPL 2$
1359 062220                                             END ;OF IF R4
```

```
1360 062220                                          END ;OF FOR R3
1361 062230                                        END ;OF FOR R5
1362 062240                                      END ;OF IF PFLAG
1363 062240                                    END ;OF FOR BANK
1364 062254                                  END ;OF FOR R0
1365 062264                                  $RETURN NOERROR
1366                                         .DSABL  LSB
```

```
1369 062270                            MAST06: SUBTST  <<MULTIPORT ASYCHRONOUS ADDRESS UNIQUENESS TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MULTIPORT ASYCHRONOUS ADDRESS UNIQUENESS TEST
                                       ;*****************************************************************************
1370                                           .ENABL  LSB
1371 062270  012737  177772  002676          MOV     #-6,MDISPLAY
1372 062276  013777  002676  120464          MOV     MDISPLAY,@DISPLAY
1373 062304                                   FOR BANK := #1 TO #167
1374 062312  013737  002510  002114            MOV   ALLCPUS,CPUBIT
1375 062320  004737  042422                    CALL  EXBANK
1376 062324  012737  000020  002114            MOV   #MASTER,CPUBIT
1377 062332                                    IF PFLAG IS FALSE AND ACFLAG IS TRUE
1378 062346                                      FOR R0 := #0 TO #3                    ;R0 := STARTING ADDRESS INDEX
1379 062350  010003                                MOV       R0,R3
1380 062352  072327  000015                        ASH       #13.,R3
1381 062356  062703  060000                        ADD       #FIRST,R3
1382 062362                                        FOR R2 := #0 TO SLAVES
1383 062364  062703  020000                          ADD     #SIZE/2,R3
1384 062370                                          IF R3 EQ #LAST+2 THEN LET R3 := #FIRST
1385 062402                                          PUSH    R3
1386 062404  000241                                  CLC
1387 062406  006003                                  ROR     R3
1388 062410  010201                                  MOV     R2,R1
1389 062412  006301                                  ASL     R1                    ;R1 := SLAVE #
1390 062414  062703  000011                          ADD     #11,R3
1391 062420  010361  002616                          MOV     R3,TASK(R1)           ;ORDER FOR ASYCHRONOUS ADD UNIQUE TEST
1392 062424                                          POP     R3
1393 062426                                        END ;OF FOR R2
1394 062436                                        PUSH      R0
1395 062440  004737  050726                        CALL      TASKDO                ;MASTER ASSUMES THE SLAVES ROLE
1396 062444                                        POP       R0
1397 062446                                        FOR R2 := #0 TO SLAVES
1398 062450  010201                                  MOV     R2,R1
1399 062452  006301                                  ASL     R1
1400 062454  012737  061165  002574                  MOV     #5*SECONDS,HUNGTIME
1401 062462  004737  072154          1$:             CALL    QUE
1402 062466                                          ON.ERROR
1403 062470  010237  002056                            MOV   R2,BAD
1404 062474  104060                                    ERROR +60                   ;SLAVE HUNG SYSTEM!
1405 062476                                            $RETURN ERROR
1406 062502                                          END ;OF ON.ERROR
1407 062502  005761  002616                          TST     TASK(R1)
1408 062506  100365                                  BPL     1$
1409 062510                                        END ;OF FOR R2
1410 062520                                      END ;OF FOR R0
1411 062530                                    END ;OF IF PFLAG
1412 062530                                  END ;OF FOR BANK
1413 062544                                  $RETURN NOERROR
1414                                         .DSABL  LSB
```

```
1417 062550                          MAST07: SUBTST  <<MULTIPORT SKEWED UP ADDRESS TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MULTIPORT SKEWED UP ADDRESS TEST
                                     ;*****************************************************************************
1418                                         .ENABL  LSB
1419 062550  012737  177771  002676          MOV     #-7,MDISPLAY
1420 062556  013777  002676  120204          MOV     MDISPLAY,@DISPLAY
1421 062564                                  FOR BANK := #1 TO #167
1422 062572  013737  002510  002114            MOV   ALLCPUS,CPUBIT
1423 062600  004737  042422                    CALL  EXBANK
1424 062604  012737  000020  002114            MOV   #MASTER,CPUBIT
1425 062612                                    IF PFLAG IS FALSE AND ACFLAG IS TRUE
1426 062626                                      FOR R2 := #0 TO #6 BY #2
1427 062630                                        FOR R0 := #0 TO SLAVES
1428 062632  010001                                   MOV     R0,R1
1429 062634  006301                                   ASL     R1
1430 062636  010203                                   MOV     R2,R3                   ;ADDRESS OFFSET (0,2,4,6)
1431 062640  000303                                   SWAB    R3
1432 062642  062703  000012                           ADD     #12,R3
1433 062646  010361  002616                           MOV     R3,TASK(R1)             ;ORDER SKEWED UP ADDRESS TEST
1434 062652                                        END ;OF FOR R0
1435 062662                                        PUSH    R2
1436 062664  004737  050726                        CALL    TASKDO
1437 062670                                        POP     R2
1438 062672                                        FOR R0 :- #0 TO SLAVES
1439 062674  010001                                   MOV     R0,R1
1440 062676  006301                                   ASL     R1
1441 062700  012737  061165  002574                   MOV     #5*SECONDS,HUNGTIME
1442 062706  004737  072154          1$:              CALL    QUE
1443 062712                                           ON.ERROR
1444 062714  010037  002056                             MOV   R0,BAD
1445 062720  104060                                     ERROR +60               ;SLAVE HUNG SYSTEM!
1446 062722                                             $RETURN ERROR
1447 062726                                           END ;OF ON.ERROR
1448 062726  005761  002616                           TST     TASK(R1)
1449 062732  100365                                   BPL     1$
1450 062734                                        END ;OF FOR R0
1451 062744                                      END ;OF FOR R2
1452 062756                                    END ;OF IF PFLAG
1453 062756                                  END ;OF FOR BANK
1454 062772                                  $RETURN NOERROR
1455                                         .DSABL  LSB
```

```
1458 062776                                MAST10: SUBTST  <<MULTIPORT PORT ARBITRATION SYMMETRY TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MULTIPORT PORT ARBITRATION SYMMETRY TEST
                                           ;*****************************************************************************
1459                                               .ENABL  LSB
1460 062776                                        IF NOCLOCK IS TRUE THEN $RETURN NOERROR
1461 063010  012737  177770  002676                MOV     #-10,MDISPLAY
1462 063016  013777  002676  117744                MOV     MDISPLAY,@DISPLAY
1463 063024                                        FOR BANK := #1 TO #167
1464 063032  013737  002510  002114                  MOV   ALLCPUS,CPUBIT
1465 063040  004737  042422                        CALL    EXBANK
1466 063044  012737  000020  002114                MOV     #MASTER,CPUBIT
1467 063052                                        IF PFLAG IS FALSE AND ACFLAG IS TRUE
1468 063066                                          FOR R0 := #0 TO SLAVES
1469 063070  010001                                    MOV     R0,R1
1470 063072  006301                                    ASL     R1
1471 063074  012761  000405  002616                    MOV     #405,TASK(R1)    ;ORDERS FOR PORT ARBITRATION SYMMETRY TEST
1472 063102                                          END ;OF FOR R0
1473 063112  004737  050726                          CALL    TASKDO
1474 063116                                          FOR R0 := #0 TO SLAVES
1475 063120  010001                                    MOV     R0,R1
1476 063122  006301                                    ASL     R1
1477 063124  012737  061165  002574                    MOV     #5*SECONDS,HUNGTIME
1478 063132  004737  072154            1$:           CALL    QUE
1479 063136                                          ON.ERROR
1480 063140  010037  002056                            MOV     R0,BAD
1481 063144  104060                                    ERROR   +60                      ;SLAVE HUNG SYSTEM!
1482 063146                                            $RETURN ERROR
1483 063152                                          END ;OF ON.ERROR
1484 063152  005761  002616                          TST     TASK(R1)
1485 063156  100365                                  BPL     1$
1486 063160                                          END ;OF FOR R0
1487 063170                                          BEGIN BALANCE
1488 063170                                          FOR R0 := #0 TO SLAVES
1489 063172  010001                                    MOV     R0,R1
1490 063174  006301                                    ASL     R1
1491 063176  013702  002646                          MOV     PORTCOUNT,R2
1492 063202  166102  002646                          SUB     PORTCOUNT(R1),R2
1493 063206  062702  000006                          ADD     #6,R2            ;SPECKED FOR + OR - 6 - 5%
1494 063212                                          IF R2 LT #0 OR R2 GT #12.
1495 063224  104036                                    ERROR   +36
1496 063226                                            LEAVE BALANCE
1497 063230                                          END ;OF IF R2
1498 063230                                        END ;OF FOR R0
1499 063240                                        END BALANCE
1500 063240                                      END ;OF IF PFLAG
1501 063240                                    END ;OF FOR BANK
1502 063254                                    $RETURN NOERROR
1503                                           .DSABL  LSB
```

```
                                MAST11: SUBTST  <<MULTIPORT PORT I/O PRIORITY TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST       MULTIPORT PORT I/O PRIORITY TEST
                                ;*****************************************************************************
                                ;
                                ;THIS TESTS THE ABILITY OF THE MEMORY PORT TO GIVE I/O HIGHER
                                ;PRIORITY THEN CPU ACCESSES
                                ;
                                ;IT DOES THIS BY USING MARGIN #6 IN THE CPU'S MAINT REGISTER
                                ;TO RAISE THE CPU PRIORITY TO THAT OF I/O.
                                ;
                                ;EACH CPU (EXCEPT ONE) HAS HIS PRIORITY RAISED AND
                                ;A TEST IS PERFORMED TO INSURE THAT THESE CPUS ARE GRANTED MORE
                                ;CYCLES THEN THE OTHER CPU.

                                ;NEED LINE CLOCK
063260                          IF NOCLOCK IS TRUE THEN $RETURN NOERROR

                                ;CAN'T DO UNLESS 4 CPU'S
063272                          IF SLAVES LT #3 THEN $RETURN NOERROR

063306  012737  177767  002676          MOV     #-11,MDISPLAY
063314  013777  002676  117446          MOV     MDISPLAY,@DISPLAY
```

```
                                                ;FOR EACH BANK THAT IS ACCESSABLE BY ALL CPU'S
                                                FOR BANK := #1 TO #167
063322                                            MOV   ALLCPUS,CPUBIT
063330  013737  002510  002114                    CALL  EXBANK
063336  004737  042422                            MOV   #MASTER,CPUBIT
063342  012737  000020  002114                    MOV BANKINDEX,R1
063350  013701  002110                            IF #BIT3 OFF.IN CONFIG(R1) ;IF NO EXTERNAL INTERLEAVE
063354                                              IF PFLAG IS FALSE AND ACFLAG IS TRUE
063364
                                                      ;EACH CPU HAS LOW PRIORITY ONCE
063400                                                FOR I := #0 TO SLAVES
063404                                                  FOR J := #0 TO SLAVES
063410                                                    IF I NE J ;IF NOT THE LOW PRIORITY CPU
063420  013701  002604                                    MOV J,R1
063424  006301                                            ASL R1
063426  012761  000016  002616                          MOV #16,TASK(R1)            ;ORDER MARGIN #6
063434                                                    IF J EQ #0
063442  004737  050726                                      CALL TASKDO
063446                                                    ELSE
063450  004737  063674                                      CALL WAIT5
063454                                                    END ;OF IF J EQ #0
063454                                                  END ;OF IF I NE J
063454                                                END ;OF FOR J := #0 TO SLAVES

                                                      ;EVERY CPU WILL DO PORT ARBITRATION TEST
063470                                                FOR R0 := #0 TO SLAVES
063472  010001                                          MOV   R0,R1
063474  006301                                          ASL   R1
063476  012761  000005  002616                        MOV #5,TASK(R1)       ;ORDER PORT ARBITRATION TEST
063504                                                END ;OF FOR R0
063514  004737  050726                                CALL    TASKDO

                                                      ;WAIT FOR DONE
063520                                                FOR R0 := #0 TO SLAVES
063522  010001                                          MOV   R0,R1
063524  006301                                          ASL   R1
063526  004737  063674                                  CALL WAIT5
063532                                                END ;OF FOR R0

                                                      ;CHECK RESULTS FOR PROPER SKEWING
063542  004737  063602                                CALL MST11A
063546                                              END ;OF FOR I := #0 TO SLAVES
063562                                            END ;OF IF PFLAG
063562                                          END ;OF IF #BIT3 OFF.IN CONFIG(R1)
063562                                        END ;OF FOR BANK
063576                                        $RETURN NOERROR
```

```
1575 063602                          MST11A: SUBTST  <<CHECK FOR PROPER SKEWING OF ACCESSES>>
                                     ;*********************************************************************************
                                     ;*SUBTEST        CHECK FOR PROPER SKEWING OF ACCESSES
                                     ;*********************************************************************************
1576 063602                                  BEGIN NOBALANCE
1577                                           ;FOR EACH CPU
1578 063602                                   FOR R0 := #0 TO SLAVES
1579 063604  010001                             MOV R0,R1
1580 063606  006301                             ASL R1
1581 063610  013703  002602                     MOV I,R3
1582 063614  006303                             ASL R3
1583 063616  016302  002646                     MOV PORTCOUNT(R3),R2        ;LOW PRIORITY PORT
1584 063622  016104  002646                     MOV PORTCOUNT(R1),R4
1585 063626  160402                             SUB R4,R2                   ;HIGH PRIORITY PORT
1586 063630  006204                             ASR R4
1587 063632  006204                             ASR R4
1588 063634  006204                             ASR R4                      ;R4 = 12.5% OF HIGH PRIORITY PORT
1589 063636                                     IF R0 NE I                  ;IF THE CPU SELECTED IS NOT THE LOW PRIORITY ONE
1590 063644                                       IF R2 LT R4
1591 063650  013737  002602  002056                 MOV I,BAD
1592 063656  104066                                 ERROR +66
1593 063660                                          LEAVE NOBALANCE
1594 063662                                       END ;OF IF R2
1595 063662                                     END ;OF IF R0 NE I
1596 063662                                   END ;OF FOR R0
1597 063672                                  END NOBALANCE
1598 063672  000207                        RETURN
1599
1600 063674                          WAIT5:  SUBTST  <<WAIT FOR 5 SECONDS FOR A SLAVE>>
                                     ;*********************************************************************************
                                     ;*SUBTEST        WAIT FOR 5 SECONDS FOR A SLAVE
                                     ;*********************************************************************************
1601                                         .ENABL LSB
1602 063674  012737  061165  002574  MOV     #5*SECONDS,HUNGTIME
1603 063702  004737  072154          1$:     CALL    QUE
1604 063706                          ON.ERROR
1605 063710  010037  002056            MOV   R0,BAD
1606 063714  104060                    ERROR +60                           ;SLAVE HUNG SYSTEM!
1607 063716                            $RETURN ERROR
1608 063722                          END ;OF ON.ERROR
1609 063722  005761  002616          TST     TASK(R1)
1610 063726  100365                  BPL     1$
1611 063730  000207                  RETURN
1612                                 .DSABL LSB
```

```
1615 063732                          MAST12: SUBTST  <<MULTIPORT EXECUTION CONTENTION TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MULTIPORT EXECUTION CONTENTION TEST
                                     ;*****************************************************************************
1616
1617 063732  012737  177766  002676          .ENABL  LSB
1618 063740  013777  002676  117022          MOV     #-12,MDISPLAY
1619 063746                                  MOV     MDISPLAY,@DISPLAY
1620 063754  013737  002510  002114          FOR BANK := #1 TO #167
1621 063762  004737  042422                    MOV   ALLCPUS,CPUBIT
1622 063766  012737  000020  002114            CALL  EXBANK
1623 063774                                    MOV   #MASTER,CPUBIT
1624 064010  004737  053640                    IF PFLAG IS FALSE AND ACFLAG IS TRUE
1625 064014                                      CALL        MRUNSETUP
1626 064016  010001                              FOR R0 := #0 TO SLAVES
1627 064020  006301                                MOV       R0,R1
1628 064022  005061  002636                        ASL       R1
1629 064026  012761  000004  002616                CLR       PTYBUF(R1)              ;CLEAR INC COUNTER
1630 064034                                        MOV       #4,TASK(R1)             ;ORDER FOR EXECUTION CONTENTION TEST
1631 064044  004737  050726                      END ;OF FOR R0
1632 064050                                      CALL        TASKDO
1633 064052  010001                              FOR R0 := #0 TO SLAVES
1634 064054  006301                                MOV       R0,R1
1635 064056  012737  061165  002574                ASL       R1
1636 064064  004737  072154          1$:           MOV       #5*SECONDS,HUNGTIME
1637 064070                                        CALL      QUE
1638 064072  010037  002056                        ON.ERROR
1639 064076  104060                                  MOV     R0,BAD
1640 064100                                          ERROR   +60                     ;SLAVE HUNG SYSTEM!
1641 064104                                          $RETURN ERROR
1642 064104  005761  002616                        END ;OF ON.ERROR
1643 064110  100365                                TST       TASK(R1)
1644 064112                                        BPL       1$
1645 064122                                      END ;OF FOR R0
1646 064122                                      BEGIN RUNCOUNT
1647 064124  010001                                FOR R0 := #0 TO SLAVES
1648 064126  006301                                  MOV     R0,R1
1649 064130  013702  002636                          ASL     R1
1650 064134  166102  002636                          MOV     PTYBUF,R2
1651 064140                                          SUB     PTYBUF(R1),R2
1652 064144  104052                                  IF R2 NE #0
1653 064146                                            ERROR +52
1654 064150                                            LEAVE RUNCOUNT
1655 064150                                          END ;OF IF R2
1656 064160                                        END ;OF FOR R0
1657 064160                                      END RUNCOUNT
1658 064160                                    END ;OF IF PFLAG
1659 064174                                  END ;OF FOR BANK
1660                                         $RETURN NOERROR
1661                                         .DSABL  LSB
1662 064200                          MAST13: SUBTST  <<MULTIPORT ASRB TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MULTIPORT ASRB TEST
                                     ;*****************************************************************************
1663 064200  000137  053752                  JMP     SUPM13          ;ACTUAL ROUTINE MUST BE IN SUPERVISOR SPACE
```

```
1666 064204                                MAST14: SUBTST  <<MULTIPORT CACHE FLUSH TEST>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MULTIPORT CACHE FLUSH TEST
                                           ;*****************************************************************************
1667                                               ;WARNING FAILURES HERE ARE USUALLY DUE TO A CACHE PROBLEM
1668                                               ;NOT A MAIN MEMORY PROBLEM.. .!!.!.!!!.!..!!.!.! !'. .'.
1669                                               .ENABL  LSB
1670 064204                                        IF #BIT3 SET.IN CACHK OR #BIT2 SET.IN CACHK
1671 064224                                          $RETURN NOERROR       ;OPERATOR HAS DISABLED PART OF CACHE
1672 064230                                        END ;OF IF #BIT3
1673
1674 064230  012737  177764  002676                MOV     #-14,MDISPLAY
1675 064236  013777  002676  116524                MOV     MDISPLAY,@DISPLAY
1676
1677 064244                                        FOR R0 := #0 TO SLAVES
1678 064246  010001                                  MOV   R0,R1
1679 064250  006301                                  ASL   R1
1680 064252                                          FOR BANK := #1 TO #167
1681 064260  013737  002510  002114                    MOV ALLCPUS,CPUBIT
1682 064266  004737  042422                            CALL        EXBANK
1683 064272  012737  000020  002114                    MOV #MASTER,CPUBIT
1684 064300                                            IF PFLAG IS FALSE AND ACFLAG IS TRUE
1685 064314                                              FOR R3 := #0 TO SLAVES
1686 064316  010304                                        MOV     R3,R4
1687 064320  006304                                        ASL     R4
1688 064322                                                IF R4 EQ R1
1689 064326  012764  000020  002616                          MOV   #20,TASK(R4)     ;CACHE FLUSH TEST COMMAND
1690 064334                                                ELSE
1691 064336  012764  000017  002616                          MOV   #17,TASK(R4)     ;CREATE STALE DATA COMMAND
1692 064344                                                END ;OF IF R4
1693 064344                                              END ;OF FOR R3
1694 064354                                              PUSH        R0,R1
1695 064360  004737  050726                              CALL        TASKDO
1696 064364                                              POP         R1,R0
1697 064370                                              FOR R3 := #0 TO SLAVES
1698 064372  010304                                        MOV     R3,R4
1699 064374  006304                                        ASL     R4
1700 064376  012737  061165  002574                       MOV     #5*SECONDS,HUNGTIME
1701 064404  004737  072154          2$:                  CALL    QUE
1702 064410                                               ON.ERROR
1703 064412  010337  002056                                 MOV   R3,BAD
1704 064416  104060                                         ERROR +60                    ;SLAVE HUNG SYSTEM!
1705 064420                                                 $RETURN ERROR
1706 064424                                               END ;OF ON.ERROR
1707 064424  005764  002616                               TST     TASK(R4)
1708 064430  100365                                       BPL     2$
1709 064432                                            END ;OF FOR R3
1710 064442                                          END ;OF IF PFLAG
1711 064442                                        END ;OF FOR BANK
1712 064456                                        END ;OF FOR R0
1713 064466                                        $RETURN NOERROR
1714                                               .DSABL  LSB
```

```
1717 064472                            MAST15: SUBTST  <<STOP SLAVES>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       STOP SLAVES
                                       ;*****************************************************************************
1718                                           .ENABL  LSB
1719 064472  012737  177763  002676          MOV     #-15,MDISPLAY
1720 064500  013777  002676  116262          MOV     MDISPLAY,@DISPLAY
1721 064506                                   FOR R0 := #1 TO SLAVES
1722 064512  010001                             MOV   R0,R1
1723 064514  006301                             ASL   R1
1724 064516  012761  000006  002616             MOV   #6,TASK(R1)              ;ORDER STOP TASK
1725 064524  012737  023542  002574             MOV   #2*SECONDS,HUNGTIME
1726 064532  004737  072154          1$:        CALL  QUE
1727 064536                                     ON.ERROR
1728 064540  010037  002C56                       MOV R0,BAD
1729 064544  104060                             ERROR       +60                ;SLAVE HUNG SYSTEM!
1730 064546                                     $RETURN ERROR
1731 064552                                     END ;OF ON.ERROR
1732 064552  005761  002616                     TST   TASK(R1)
1733 064556  100365                           BPL   1$
1734 064560                                   END ;OF FOR R0
1735 064570                                   $RETURN NOERROR
1736                                          .DSABL  LSB
```

```
1739                                    .SBTTL  ERROR DATA SETUP
1740
1741                            ;       USE THIS        IF THIS CONDITION DISCRIBES THE ERROR
1742                            ;
1743                            ;       PERR01          TRAP
1744                            ;                       BAD DATA IN R0 UNLESS ABORTED
1745                            ;                               THEN BAD DATA IS POINTED TO BY -(R4)
1746                            ;                       GOOD DATA IN R5
1747                            ;
1748                            ;       PERR02          TRAP
1749                            ;                       BAD DATA IN R1 UNLESS ABORTED
1750                            ;                               THEN BAD DATA IS POINTED TO BY -(R4)
1751                            ;                       GOOD DATA IN R2
1752                            ;
1753                            ;       PERR03          TRAP
1754                            ;                       BAD DATA IS POINTED TO BY -(R1)
1755                            ;                       GOOD DATA IN R4
1756                            ;
1757                            ;       PERR04          TRAP
1758                            ;                       BAD DATA IN R4 UNLESS ABORTED
1759                            ;                               THEN BAD DATA IS POINTED TO BY -2(R0)
1760                            ;                       GOOD DATA IN R2
1761                            ;
1762                            ;       PERR05          JSR     PC
1763                            ;                       BAD DATA IS POINTED TO BY -(R0)
1764                            ;                       GOOD DATA IN R2
1765                            ;                       RETURN AFTER SETTING UP GOOD,BAD,ADDRESS
1766                            ;
1767                            ;       PERR06          JSR     PC
1768                            ;                       BAD DATA IS POINTED TO BY -(R0)
1769                            ;                       GOOD DATA IS ZERO
1770                            ;                       RETURN AFTER SETTING UP GOOD,BAD,ADDRESS
1771                            ;
1772                            ;       PERR07          TRAP
1773                            ;                       BAD DATA IN R2 UNLESS ABORTED
1774                            ;                               THEN BAD DATA IS POINTED TO BY (R1)
1775                            ;                       GOOD DATA IN DATBUF
1776                            ;
1777                            ;       PERR10          TRAP
1778                            ;                       BAD DATA IN R2 UNLESS ABORTED
1779                            ;                               THEN BAD DATA IS POINTED TO BY 2(R1)
1780                            ;                       GOOD DATA IN DATBUF+2
1781                            ;
1782                            ;       PERR11          TRAP
1783                            ;                       BYTE TEST
1784                            ;                       BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
1785                            ;                               THEN BAD DATA IS POINTED TO BY (R1)
1786                            ;                       GOOD DATA IS A ZERO BYTE
1787                            ;
1788                            ;       PERR12          TRAP
1789                            ;                       BYTE TEST
1790                            ;                       BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
1791                            ;                               THEN BAD DATA IS POINTED TO BY (R1)
1792                            ;                       GOOD DATA IS A BYTE OF ONES
1793                            ;
1794                            ;       PERR13          TRAP
1795                            ;                       BAD DATA IN R0 UNLESS ABORTED
```

```
1796                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1797                                            ;       GOOD DATA IS ZERO
1798                                            ;
1799                                            ; PERR14      TRAP
1800                                            ;       BAD DATA IN R0 UNLESS ABORTED
1801                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1802                                            ;       GOOD DATA IS ONES
1803                                            ;
1804                                            ; PERR15      TRAP
1805                                            ;       BAD DATA IN R0 UNLESS ABORTED
1806                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1807                                            ;       GOOD DATA IN TSTDAT
1808                                            ;
1809                                            ; PERR16      TRAP
1810                                            ;       BAD DATA IN R0 UNLESS ABORTED
1811                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1812                                            ;       GOOD DATA IN TSTDAT+2
1813                                            ;
1814                                            ; PERR17      TRAP
1815                                            ;       BAD DATA IN R0 UNLESS ABORTED
1816                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1817                                            ;       GOOD DATA IN R2
1818                                            ;
1819                                            ; PERR20      TRAP
1820                                            ;       BAD DATA IN R0 UNLESS ABORTED
1821                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1822                                            ;       GOOD DATA IN R3
1823                                            ;
1824                                            ; PERR21      TRAP
1825                                            ;       7 BIT BYTE TEST
1826                                            ;       BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
1827                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1828                                            ;       GOOD DATA IS A 7 BIT BYTE ON ONES
1829                                            ;
1830                                            ; PERR22      TRAP
1831                                            ;       BAD DATA IN R2 UNLESS ABORTED
1832                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1833                                            ;       GOOD DATA IN R0
1834                                            ;
1835                                            ; PERR23      TRAP
1836                                            ;       BAD DATA IN R0 UNLESS ABORTED
1837                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1838                                            ;       GOOD DATA IN R4
1839                                            ;
1840                                            ; PERR24      TRAP
1841                                            ;       BAD DATA IN R0 UNLESS ABORTED
1842                                            ;               THEN BAD DATA IS POINTED TO BY (R2)
1843                                            ;       GOOD DATA IN R3
1844                                            ;
1845                                            ; PERR25      TRAP
1846                                            ;       BAD DATA POINTED TO BY -(R1)
1847                                            ;       GOOD DATA IN R2 UNLESS LOC V177654 IS SET
1848                                            ;               THEN GOOD DATA IS IN R3
1849                                            ;
1850                                            ; PERR26      TRAP
1851                                            ;       BAD DATA IS DOUBLE WORD POINTED TO BY R1 AND IN LOW 7 BITS OF R0
1852                                            ;       GOOD DATA IS 000000,,100000,,100
```

```
1853                    ;
1854                    ;   PERR27      TRAP
1855                    ;                BAD DATA IS DOUBLE WORD POINTED TO BY R1 AND IN LOW 7 BITS OF R0
1856                    ;                GOOD DATA IS 000000,,000000,,077
1857                    ;
1858                    ;   PERR30      TRAP
1859                    ;                BAD DATA IS POINTED TO BY -16(SP)
1860                    ;                GOOD DATA IS IN R1
1861                    ;
1862                    ;   PERR31      TRAP
1863                    ;                SPECIAL ECC FAILURE HANDLER
1864                    ;
1865                    ;   PERR32      TRAP
1866                    ;                SPECIAL ECC FAILURE HANDLER
1867                    ;
1868                    ;   PERR33      TRAP
1869                    ;                SPECIAL ECC FAILURE HANDLER
1870                    ;
1871                    ;   PERR34      TRAP
1872                    ;                SPECIAL ECC FAILURE HANDLER
1873                    ;
1874                    ;   PERR35      TRAP
1875                    ;                SPECIAL BRANCH GOBBLE FAILURE HANDLER
1876                    ;
1877                    ;        CALLING SEQUENCE FOR TRAP TYPES
1878                    ;        BEQ     2$              ;NO - ERROR,BRANCH FOR CARD
1879                    ;        PERRXX                  ;TRAP TO ERROR ROUTINE
1880                    ;2$:     NEXT    INSTRUCTION     ;CONTINUE TESTING
```

```
1883 064574  010437  002040          $PER01: MOV     R4,ADDRESS
1884 064600  162737  000002  002040          SUB     #2,ADDRESS
1885 064606  010037  002056                  MOV     R0,BAD
1886 064612  010537  002050                  MOV     R5,GOOD
1887 064616  000137  065330                  JMP PERRAW
1888
1889 064622  010437  002040          $PER02: MOV     R4,ADDRESS
1890 064626  162737  000002  002040          SUB     #2,ADDRESS
1891 064634  010137  002056                  MOV     R1,BAD
1892 064640  010237  002050                  MOV     R2,GOOD
1893 064644  000137  065330                  JMP PERRAW
1894
1895 064650  010137  002040          $PER03: MOV     R1,ADDRESS
1896 064654  162737  000002  002040          SUB     #2,ADDRESS
1897 064662  010437  002050                  MOV     R4,GOOD
1898 064666  016137  177776  002056          MOV     -2(R1),BAD
1899 064674  000137  065330                  JMP PERRAW
1900
1901 064700  010037  002040          $PER04: MOV     R0,ADDRESS
1902 064704  162737  000002  002040          SUB     #2,ADDRESS
1903 064712  010437  002056                  MOV     R4,BAD
1904 064716  010237  002050                  MOV     R2,GOOD
1905 064722  000137  065330                  JMP     PERRAW
1906
1907 064726  010237  002050          PERR05: MOV     R2,GOOD
1908 064732  014037  002056          PERA05: MOV     -(R0),BAD
1909 064736  010037  002040                  MOV     R0,ADDRESS
1910 064742  062700  000002                  ADD     #2,R0           ;RESTORE R0
1911 064746  004737  036770                  CALL    BADSTACK
1912 064752  000207                          RETURN
1913
1914 064754  005037  002050          PERR06: CLR     GOOD
1915 064760  000764                          BR      PERA05
1916
1917 064762  010137  002040          $PER07: MOV     R1,ADDRESS
1918 064766  010237  002056                  MOV     R2,BAD
1919 064772  013737  002340  002050          MOV     DATBUF,GOOD
1920 065000  000137  065330                  JMP     PERRAW
1921
1922 065004                          $PER10: LET ADDRESS := R1 + #2
1923 065016                                  LET BAD := R2
1924 065022                                  LET GOOD := DATBUF+2
1925 065030  000137  065330                  JMP     PERRAW
1926
1927 065034                          $PER11: LET ADDRESS := R1
1928 065040                                  LET BAD := R0
1929 065044                                  LET GOOD := #0
1930 065050  000137  065402                  JMP     PERRAB
1931
1932 065054                          $PER12: LET ADDRESS := R1
1933 065060                                  LET BAD := R0
1934 065064                                  LET GOOD := #377
1935 065072  000137  065402                  JMP     PERRAB
```

```
1938 065076                          $PER13: LET ADDRESS := R1
1939 065102                                  LET BAD := R0
1940 065106                                  LET GOOD := #0
1941 065112  000137  065330                  JMP     PERRAW
1942
1943 065116                          $PER14: LET ADDRESS := R1
1944 065122                                  LET BAD := R0
1945 065126                                  LET GOOD := ONES
1946 065134  000137  065330                  JMP     PERRAW
1947
1948 065140                          $PER15: LET ADDRESS := R1
1949 065144                                  LET BAD := R0
1950 065150                                  LET GOOD := TSTDAT
1951 065156  000137  065330                  JMP     PERRAW
1952
1953 065162                          $PER16: LET ADDRESS := R1
1954 065166                                  LET BAD := R0
1955 065172                                  LET GOOD := TSTDAT+2
1956 065200  000453                          BR      PERRAW
1957
1958 065202                          $PER17: LET ADDRESS := R1
1959 065206                                  LET BAD := R0
1960 065212                                  LET GOOD := R2
1961 065216  000444                          BR      PERRAW
1962
1963 065220                          $PER20: LET ADDRESS := R1
1964 065224                                  LET BAD := R0
1965 065230                                  LET GOOD := R3
1966 065234  000435                          BR      PERRAW
1967
1968 065236                          $PER21: LET ADDRESS := R1
1969 065242                                  LET BAD := R0
1970 065246                                  LET GOOD := #177
1971 065254  000477                          BR      PERRA7
1972
1973 065256                          $PER22: LET ADDRESS := R1
1974 065262                                  LET BAD := R2
1975 065266                                  LET GOOD := R0
1976 065272  000416                          BR      PERRAW
1977
1978 065274                          $PER23: LET ADDRESS := R1
1979 065300                                  LET BAD := R0
1980 065304                                  LET GOOD := R4
1981 065310  000407                          BR      PERRAW
1982
1983 065312                          $PER24: LET ADDRESS := R2
1984 065316                                  LET BAD := R0
1985 065322                                  LET GOOD := R3
1986 065326  000400                          BR      PERRAW
```

```
 1988 065330                          PERRAW: SUBTST  <<DATA WAS A WORD>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       DATA WAS A WORD
                                      ;*****************************************************************************
 1989 065330  004737  065564                  CALL    PERBNK
 1990 065334                                  IF ABORTFLAG IS TRUE THEN $CALL GETDATA
 1991 065346                                  IF BADPC EQ #0 THEN $CALL BADSTACK
 1992 065360  004737  065540                  CALL    PERXOR
 1993 065364                                  IF ABORTFLAG IS FALSE
 1994 065372  104011                            ERROR +11
 1995 065374                                  ELSE
 1996 065376  104012                            ERROR +12
 1997 065400                                  END ;OF IF ABORTFLAG
 1998 065400  000002                          RTI
 1999
 2000 065402                          PERRAB: SUBTST  <<DATA WAS A BYTE>>
                                      ;*****************************************************************************
                                      ;*SUBTEST       DATA WAS A BYTE
                                      ;*****************************************************************************
 2001 065402  004737  065564                  CALL    PERBNK
 2002 065406                                  IF ABORTFLAG IS TRUE THEN $CALL GETDATA
 2003 065420                                  IF BADPC EQ #0 THEN $CALL BADSTACK
 2004 065432  004737  065540                  CALL    PERXOR
 2005 065436                                  IF ABORTFLAG IS FALSE
 2006 065444  104014                            ERROR +14
 2007 065446                                  ELSE
 2008 065450  104015                            ERROR +15
 2009 065452                                  END ;OF IF ABORTFLAG
 2010 065452  000002                          RTI
```

```
2013 065454                          PERRA7: SUBTST  <<DATA WAS A 7 BIT BYTE>>
                                     ;*************************************************************************
                                     ;*SUBTEST        DATA WAS A 7 BIT BYTE
                                     ;*************************************************************************
2014 065454                                  IF BADPC EQ #0 THEN $CALL BADSTACK
2015 065466  004737  065540                  CALL    PERXOR
2016 065472  004737  065564                  CALL    PERBNK
2017 065476  104022                          ERROR   +22
2018 065500  000002                          RTI
2019
2020 065502                          $PER26: LET GOOD2 := #100000
2021 065510                                  LET GOOD3 := #100
2022 065516  000137  054652                  JMP PERRA3
2023
2024 065522  005037  002052          $PER27: CLR     GOOD2
2025 065526                                  LET GOOD3 := #077
2026 065534  000137  054652                  JMP PERRA3
2027
2028 065540                          PERXOR: SUBTST  <<DETERMINE XOR OF GOOD & BAD>>
                                     ;*************************************************************************
                                     ;*SUBTEST        DETERMINE XOR OF GOOD & BAD
                                     ;*************************************************************************
2029 065540                                  PUSH    R0
2030 065542  013700  002050                  MOV     GOOD,R0
2031 065546  013737  002056  002064          MOV     BAD,BADXOR
2032 065554  074037  002064                  XOR     R0,BADXOR
2033 065560                                  POP     R0
2034 065562  000207                          RETURN
```

```
 2037 065564                                PERBNK: SUBTST<<LOG ERROR ON BAD BANK>>
                                            ;*****************************************************************************
                                            ;*SUBTEST       LOG ERROR ON BAD BANK
                                            ;*****************************************************************************
 2038                                               ;WHILE WE'RE HERE LET'S MARK THE BAD BANK IN THE CONFIGURATION TABLE
 2039 065564                                        PUSH    R0,R1
 2040 065570  013701  002106                        MOV     BANK,R1
 2041 065574  070127  000006                        MUL     #6,R1
 2042 065600  052761  004000  003016                BIS     #BIT11,CONFIG(R1)
 2043 065606  062701  000005                        ADD     #5,R1           ;POINT TO MAX ERROR BYTE
 2044 065612  105261  003016                        INCB    CONFIG(R1)      ;BUMP BANK COUNTER
 2045 065616  001002                                BNE     12$             ;NO OVERFLOW - SKIP
 2046 065620  105361  003016                        DECB    CONFIG(R1)      ;SET BACK TO 255.
 2047 065624  126137  003016  002702  ^2$:        CMPB    CONFIG(R1),ERRMAX       ;IS IT PAST MAX?
 2048 065632  101403                               BLOS    11$             ;NO - SKIP
 2049 065634                                        SET     TOOMANY         ;YES
 2050 065642                                PERECC: POP     R1,R0
 2051 065646  000207                                RETURN
 2052
 2053 065650  010137  002040                PERECC: MOV     R1,ADDRESS
 2054 065654  010037  002056                        MOV     R0,BAD
 2055 065660                                        IF R1 EQ TESTADD
 2056 065666  013737  002344  002050                  MOV TSTDAT,GOOD
 2057 065674                                        ELSE
 2058 065676  013737  002346  002050                  MOV   TSTDAT+2,GOOD
 2059 065704                                        END ;OF IF R1
 2060 065704  004737  065540                        CALL    PERXOR
 2061 065710                                        SET     HEADER
 2062 065716  000207                                RETURN
 2063
 2064 065720                                $PER31: IF BADPC EQ #0 THEN $CALL BADSTACK
 2065 065732  004737  065650                        CALL    PERECC
 2066 065736                                        IF REALPAT EQ #11
 2067 065746  104042                                  ERROR +42
 2068 065750                                        END ;OF IF REALPAT
 2069 065750                                        IF REALPAT EQ #14
 2070 065760  104045                                  ERROR +45
 2071 065762                                        END ;OF IF REALPAT
 2072 065762                                        IF REALPAT EQ #15
 2073 065772  104046                                  ERROR +46
 2074 065774                                        END ;OF IF REALPAT
 2075 065774                                        IF REALPAT EQ #16
 2076 066004  104047                                  ERROR +47
 2077 066006                                        END ;OF IF REALPAT
 2078 066006                                        SET HEADER
 2079 066014  000002                                RTI
```

```
2082 066016                                $PER32: IF BADPC EQ #0 THEN $CALL BADSTACK
2083 066030  010137  002040                        MOV     R1,ADDRESS
2084 066034  010037  002056                        MOV     R0,BAD
2085 066040  010237  00205C                        MOV     R2,GOOD
2086 066044                                        SET     HEADER
2087 066052  104043                                ERROR   +43
2088 066054                                        SET     HEADER
2089 066062  000002                                RTI
2090
2091 066064                                $PER33: IF BADPC EQ #0 THEN $CALL BADSTACK
2092 066076  010137  002040                        MOV     R1,ADDRESS
2093 066102  010037  002056                        MOV     R0,BAD
2094 066106  105037  002057                        CLRB    BAD+1
2095 066112  012737  000377  002050                MOV     #377,GOOD
2096 066120  004737  065540                        CALL    PERXOR
2097 066124                                        SET     HEADER
2098 066132  104044                                ERROR   +44
2099 066134                                        SET     HEADER
2100 066142  000002                                RTI
2101
2102 066144                                $PER34:IF BADPC EQ #0 THEN $CALL BADSTACK
2103 066156                                        IF #BIT15!BIT4 OFF.IN CSR
2104 066166  104016                                  ERROR +16                    ;NO SBE OR DBE
2105 066170                                        ELSE
2106 066172  104001                                  ERROR +1                     ;EXPECTED SBE SO DBE MUST HAVE GOTTEN SET
2107 066174                                        END ;OF IF #BIT15.BIT4
2108 066174  000002                                RTI
2109
2110                                               ;DURING BRANCH GOBBLE THE CONDITION CODES WERE WRONG
2111 066176  004737  065564                $PER35: CALL    PERBNK
2112 066202  004737  036770                        CALL    BADSTACK
2113 066206  013737  002036  002056                MOV     BADPSW,BAD
2114 066214  012737  000012  002050                MOV     #12,GOOD
2115 066222  104054                                ERROR   +54
2116 066224  062706  000004                        ADD     #4,SP                ;FIX STACK FROM TRAP
2117 066230  000207                                RETURN                       ;ABORTING TEST
```

```
                                        .SBTTL  ROUTINE SCOPE HANDLER
                                ;*******************************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE DISPLAY DATA INTO THE DISPLAY REGISTER
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW9=1 LOOP ON ERROR
                                ;*CALL
                                ;*      SCOPE           ;.SCOPE=IOT
066232  005237  075144          $SCOPE: INC     $DEVCT          ;TELL APT WE ARE ALIVE
066236                                  IF RESULT IS LT
066240  005037  075144                    CLR   $DEVCT
066244  105237  075146                    INCB  $UNIT
066250                                  END ;OF IF RESULT
066250  104410                          CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
066252                                  IF CPUBIT EQ #MASTER    ;IF I'M THE MASTER
066262                                    IF PTYFLAG IS TRUE OR PTYFLAG+2 IS TRUE OR PTYFLAG+4 IS TRUE OR PTYFLAG+6 IS TRUE
066312  004737  072154                      CALL QUE
066316                                    END ;OF IF PTYFLAG
066316                                  END ;OF IF CPUBIT
066316                                  IF STOPOK IS TRUE AND #SW8 SET.IN @SWR
066334  005037  002520                    CLR   STOPOK
066340                                    TYPE   MSG112         ;PROGRAM HALTING BECAUSE OF SWITCH #8
066344  000137  043522                    JMP   EXIT
066350                                  END ;OF IF STOPOK
066350                                  IF NOSCOPE IS TRUE
066356  000002                            RTI
066360                                  END ;OF IF NOSCOPE
066360                          1$:     IF #SW14 SET.IN @SWR THEN GOTO $OVER
                                ;#####START OF CODE FOR THE XOR TESTER#####
066370  000421                  $XTSTR: BR      2$              ;;IF RUNNING ON THE 'XOR' TESTER CHANGE
                                                                ;;THIS INSTRUCTION TO A 'NOP' (NOP=240)
066372  013746  000004                  MOV     ERRVEC,-(SP)    ;;SAVE THE CONTENTS OF THE ERROR VECTOR
066376  012737  066416  000004          MOV     #1$,ERRVEC      ;;SET FOR TIMEOUT
066404  005737  177060                  TST     177060  ;;TIME OUT ON XOR?
066410  012637  000004                  MOV     (SP)+,ERRVEC    ;;RESTORE THE ERROR VECTOR
066414  000424                          BR      $SVLAD          ;;GO TO THE NEXT TEST
066416  062706  000004          1$:     ADD     #4,SP           ;FIX STACK FROM TRAP
066422  005037  177766                  CLR     CPUERR          ;RESET CPU ERROR REGISTER
066426  012637  000004                  MOV     (SP)+,ERRVEC    ;;RESTORE THE ERROR VECTOR
066432  000407                          BR      4$              ;;LOOP ON THE PRESENT TEST
066434                          2$:;#####END OF CODE FOR THE XOR TESTER#####
066434  105737  002016          3$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
066440  001412                          BEQ     $SVLAD          ;;BR IF NO
066442  032777  001000  114316          BIT     #SW9,@SWR       ;;LOOP ON ERROR?
066450  001404                          BEQ     5$              ;;BR IF NO
066452  013737  002750  002746  4$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
066460  000410                          BR      $OVER
066462  105037  002016          5$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
066466  011637  002746          $SV AD: MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
066472  011637  002750                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
066476  005037  002454                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
066502  004737  066514          $OVER:  CALL    GETDIS
066506  013716  002746                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
066512  000002                          RTI                     ;;FIXES PS
```

```
 2176 066514                                GETDIS: SUB'ST  <<SUBR  DISPLAY>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        SUBR    DISPLAY
                                            ;*****************************************************************************
 2177 066514  113737  002106  002015               MOVB    BANK,$BANK
 2178 066522  113737  002366  002014               MOVB    REALPAT,$PATMAR
 2179 066530                                       PUSH    R0,4
 2180 066536                                       SET4    #2$             ;TRAPS TO 4 GOTO 2$
 2181 066544  005000                               CLR     R0
 2182 066546  013700  177750                       MOV     MAINT,R0
 2183 066552  072027  000004                       ASH     #4,R0
 2184 066556  000402                               BR      3$
 2185 066560  062706  000004               2$:     ADD     #4,SP                   ;FIX STACK FROM TRAP
 2186 066564  042700  177437               3$:     BIC     #^C340,R0
 2187 066570  150037  002014                       BISB    R0,$PATMAR
 2188 066574  005737  002134                       TST     RLFLAG                  ;ARE WE RELOCATED?
 2189 066600  001403                               BEQ     1$                      ;NO - SKIP
 2190 066602  052737  100000  002014               BIS     #BIT15,$PATMAR          ;YES - SET MSB
 2191 066610                                1$:     IF MDISPLAY NE #0 THEN LET $PATMAR := MDISPLAY
 2192 066624  013777  002014  114136               MOV     $PATMAR,@DISPLAY
 2193 066632  013737  002014  000174               MOV     $PATMAR,DISPREG         ;SOFTWARE DISPLAY REGISTER
 2194 066640                                       POP     4,R0
 2195 066646                                       RES4                            ;RESTORE TRAPS TO 4 TO DEFAULT
 2196 066660  000207                               RETURN
```

```
                                        .SBTTL  ROUTINE ERROR HANDLER
                                ;*******************************************************************************
                                ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                ;*AND GO TO $ERRTYP ON ERROR
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW15=1         HALT ON ERROR
                                ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                ;*SW10=1         BELL ON ERROR
                                ;*SW9=1 LOOP ON ERROR
                                ;*CALL
                                ;*      ERROR   N       ;;ERROR EMT AND N-ERROR ITEM NUMBER
                                
                                        .ENABL  LSB
066662                          $ERROR: IF NOERROR IS FALSE
066670  104410                            CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
066672  105237  002016          1$:       INCB  $ERFLG            ;;SET THE ERROR FLAG
066676  001775                            BEQ   1$                ;;DON'T LET THE FLAG GO TO ZERO
066700  004737  066514                     CALL  GETDIS            ;SETUP DISPLAY STUFF
066704  013737  002014  075140            MOV   $PATMAR,$TESTN    ;FOR APT
066712  032777  002000  114046            BIT   #SW10,@SWR        ;;BELL ON ERROR?
066720  001404                            BEQ   2$                ;;NO - SKIP
066722                                    TYPE  $BELL             ;;RING BELL
066726                                    TYPE  MSG014            ;CONTROL Z
066732  005237  002754          2$:       INC   $ERTTL            ;;COUNT THE NUMBER OF ERRORS
066736                                    IF RESULT IS MI
066740  012737  077777  002754                  MOV #77777,$ERTTL
066746                                    END ;OF IF RESULT
066746                                  END ;OF IF NOERROR
066746  011637  002024                  MOV     (SP),ERRPC      ;;GET ADDRESS OF ERROR INSTRUCTION
066752  162737  000002  002024          SUB     #2,ERRPC
066760  010637  002030                  MOV     SP,ERRSP
066764  016637  000002  002034          MOV     2(SP),ERRPSW
066772  117737  113026  002017          MOVB    @ERRPC,$ITEMB   ;;STRIP AND SAVE THE ERROR ITEM CODE
067000                                  IF NOERROR IS FALSE
067006                                    IF BADPC NE #0
067014  013737  002026  002024                MOV BADPC,ERRPC
067022  162737  000002  002024                SUB #2,ERRPC
067030  013737  002032  002030                MOV BADSP,ERRSP
067036  013737  002036  002034                MOV BADPSW,ERRPSW
067044  005037  002026                      CLR BADPC
067050                                    END ;IF
067050  013737  002024  075136            MOV   ERRPC,$FATAL      ;FOR APT
067056                                    IF #SW13 SET.IN @SWR OR SLAVERROR IS TRUE
067074  000412                              BR  3$
067076                                    END ;OF IF #SW13
067076                                    IF #SW5 SET.IN @SWR AND TOOMANY IS TRUE
067114                                      GOTO 3$
067116                                    END ;OF IF #SW5
067116                                  END ;OF IF NOERROR
067116  004737  067324                  CALL    $ERRTYP         ;;GO TO USER ERROR ROUTINE
```

```
2251 067122                            3$:     IF NOERROR IS FALSE
2252 067130  005777  113632                      TST   @SWR              ;;HALT ON ERROR
2253 067134  100002                              BPL   7$                ;;SKIP IF CONTINUE
2254 067136  000000                    $HALT:    HALT                    ;;HALT ON ERROR!
2255 067140  104410                              CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
2256 067142                            7$:       IF NOSCOPE IS FALSE AND #SW9 SET.IN @SWR
2257 067160  013716  002750                        MOV $LPERR,(SP)       ;;FUDGE RETURN FOR LOOPING
2258 067164                                      END ;OF IF NOSCOPE
2259 067164  005737  002454                      TST   $ESCAPE           ;;CHECK FOR AN ESCAPE ADDRESS
2260 067170  001402                              BEQ   9$                ;;BR IF NONE
2261 067172  013716  002454                      MOV   $ESCAPE,(SP)      ;;FUDGE RETURN ADDRESS FOR ESCAPE
2262 067176                            9$:       IF DETFLAG IS FALSE
2263 067204                                        IF ACTFLAG IS TRUE OR APTFLAG IS TRUE OR FATAL$ IS TRUE
2264 067226  012737  000001  075134                   MOV       #1,$MSGTY       ;FOR APT
2265 067234  000137  043522                         JMP       EXIT
2266 067240                                      END ;OF IF ACTFLAG
2267 067240                                      IF XXDPCHAIN IS TRUE AND $ERTTL HI #20
2268 067256                                        TYPE      MSG066            ;ERROR COUNT EXCEEDED 20 - ABORTING FOR XXDP CHAIN
2269 067262  013700  000042                      MOV       42,R0
2270 067266  005037  000042                      CLR       42
2271 067272  000137  014760                      JMP       $ZAP42
2272 067276                                      END ;OF IF XXDPCHAIN
2273 067276                                    END ;OF IF DETFLAG
2274 067276                                  ELSE
2275 067300                                    SET   HEADER
2276 067306                                  END ;OF IF NOERROR
2277 067306                            10$:    CLEAR   TOOMANY,CPUERR,NOERROR
2278 067322  000002                            RTI                       ;;RETURN
2279                                           .DSABL  LSB
```

```
                                        .SBTTL  ROUTINE ERROR MESSAGE TYPEOUT'

                                ;**************************************************************************
                                ;*THIS ROUTINE USES THE ''ITEM CONTROL BYTE'' ($ITEMB) TO DETERMINE WHICH
                                ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE 'ERROR TABLE'' ($ERRTB ,
                                ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

067324  104415                %ERRTYP:SAVREG
067326                                  TYPE    $CRLF           ;;''CARRIAGE RETURN'' & 'LINE FEED''
067332  005000                          CLR     R0              ;;PICKUP THE ITEM INDEX
067334  153700  002017                  BISB    $ITEMB,R0
067340  001004                          BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                ;;TYPE THE PC OF THE ERROR
067342                                  TYPOCT  ERRPC,<ERROR ADDRESS>
067350  000512                          BR      11$             ;;GET OUT
067352  005300                  1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
067354  006300                          ASL     R0              ;;      WORK FOR THE ERROR TABLE
067356  006300                          ASL     R0
067360  006300                          ASL     R0
067362  062700  101372                  ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
067366  012037  067424                  MOV     (R0)+,3$        ;;PICKUP 'ERROR MESSAGE'' POINTER
067372  001417                          BEQ     4$              ;;SKIP TYPEOUT IF NO POINTER
067374  005737  002530                  TST     NOERROR         ;IS THIS REALLY AN ERROR?
067400  001003                          BNE     12$             ;YES - SKIP
067402  005737  002724                  TST     HEADER          ;TYPE HEADER?
067406  100011                          BPL     4$              ;NO - SKIP
067410  005737  002070          12$:    TST     FATAL$          ;WAS IT A FATAL ERROR?
067414  001402                          BEQ     2$              ;NO - SKIP
067416                                  TYPE    MSG067          ;FATAL
067422                          2$:     TYPE                    ;;TYPE THE 'ERROR MESSAGE''
067424  000000                  3$:     .WORD   0               ;;'ERROR MESSAGE'' POINTER GOES HERE
067426                                  TYPE    $CRLF           ;;''CARRIAGE RETURN'' & 'LINE FEED''
067432  012037  067456          4$:     MOV     (R0)+,5$        ;;PICKUP 'DATA HEADER'' POINTER
067436  001412                          BEQ     6$              ;;SKIP TYPEOUT IF 0
067440  005737  002530                  TST     NOERROR         ;IS THIS REALLY AN ERROR?
067444  001003                          BNE     13$             ;YES - SKIP
067446  005737  002724                  TST     HEADER          ;TYPE HEADER?
067452  100004                          BPL     6$              ;NO - SKIP
067454                          13$:    TYPE                    ;;TYPE THE 'DATA HEADER''
067456  000000                  5$:     .WORD   0               ;;'DATA HEADER'' POINTER GOES HERE
067460                                  TYPE    $CRLF           ;;''CARRIAGE RETURN'' & 'LINE FEED''
067464  012001                  6$:     MOV     (R0)+,R1        ;;PICKUP 'DATA TABLE'' POINTER
067466  001436                          BEQ     10$             ;;BR IF NO DATA TO BE TYPED
067470  012002                          MOV     (R0)+,R2        ;;PICKUP 'DATA FORMA'' POINTER
```

```
 2328 067472  112203                7$:     MOVB    (R2)+,R3
 2329 067474  006303                        ASL     R3              ;MAKE IT A WORD ADDRESS
 2330 067476  004773  067504               CALL    @8$(R3)
 2331 067502  000421                        BR      9$
 2332 067504  067636                8$:     TAG70$
 2333 067506  067646                        TAG71$
 2334 067510  067656                        TAG72$
 2335 067512  067722                        TAG73$
 2336 067514  067730                        TAG74$
 2337 067516  067742                        TAG75$
 2338 067520  067754                        TAG76$
 2339 067522  067776                        TAG77$
 2340 067524  070000                        TAG78$
 2341 067526  070006                        TAG79$
 2342 067530  070066                        TAG80$
 2343 067532  070100                        TAG81$
 2344 067534  070122                        TAG82$
 2345 067536  070324                        TAG83$
 2346 067540  070410                        TAG84$
 2347 067542  070502                        TAG85$
 2348 067544  070612                        TAG86$
 2349 067546  062701  000002          9$:     ADD     #2,R1           ;UPDATE DATA TABLE POINTER
 2350 067552  005711                        TST     (R1)            ;;IS THERE ANOTHER NUMBER?
 2351 067554  001403                        BEQ     10$             ;;BR IF NO
 2352 067556                                TYPE    MSG018          ;TYPE 2 SPACES
 2353 067562  000743                        BR      7$              ;;LOOP
 2354
 2355 067564  005737  002116          10$:    TST     MUT             ;IS THERE A MEMORY UNDER TEST
 2356 067570  001402                        BEQ     11$             ;NO - SKIP
 2357 067572  005237  002724                INC     HEADER          ;YES - BUMP HEADER FLAG
 2358 067576  104416                11$:    RESREG
 2359 067600                                IF #SW7 SET.IN @SWR AND DETFLAG IS FALSE AND NOERROR IS FALSE
 2360 067624  004737  071364                  CALL  DETAIL
 2361 067630                                END ;OF IF #SW7
 2362 067630                                TYPE    MSG104          ;CONTROL Z
 2363 067634  000207                        RETURN
```

```
                                ;*****************************************************************************
                                ;*** OCTAL ***
                                ;*****************************************************************************
067636                          TAG70$: TYPOCT  @(R1)           ;;TYPE AN OCTAL NUMBER
067644  000207                          RETURN

                                ;*****************************************************************************
                                ;*** DECIMAL ***
                                ;*****************************************************************************
067646                          TAG71$: TYPDEC  @(R1)           ,;TYPE A DECIMAL NUMBER
067654  000207                          RETURN

                                ;*****************************************************************************
                                ;*** INTERLEAVE ***
                                ;*****************************************************************************
067656                          TAG72$: PUSH    R1,R5
067662  013701  002106                  MOV     BANK,R1
067666  070127  000006                  MUL     #6,R1
067672                                  SET     NOTAB                   ;INDICATE NO TABLE TO BE PRINTED - NOW
067700  004737  036012                  CALL    TCFIG1
067704  005037  002464                  CLR     NOTAB
067710                                  POP     R5,R1
067714                                  TYPE    MSG014                  ;1 SPACE
067720  000207                          RETURN

                                ;*****************************************************************************
                                ;*** BOX ***
                                ;*****************************************************************************
067722  004737  070672          TAG73$: CALL    WHOBOX
067726  000207                          RETURN

                                ;*****************************************************************************
                                ;*** PATTERN ***
                                ;*****************************************************************************
067730                          TAG74$: TYPOCS  REALPAT,<TYPE (0-77)>,2,Z
067740  000207                          RETURN

                                ;*****************************************************************************
                                ;*** BANK ***
                                ;*****************************************************************************
067742                          TAG75$: TYPOCS  BANK,<TYPE (0-167)>,3
067752  000207                          RETURN

                                ;*****************************************************************************
                                ;*** MTYPE ***
                                ;*****************************************************************************
067754  005737  002126          TAG76$: TST     MKFLAG
067760  001003                          BNE     1$
067762                                  TYPE    MSG068          ;MJ11
067766  000207                          RETURN
067770                          1$:     TYPE    MSG069          ;MK11
067774  000207                          RETURN
```

```
                                        ;*****************************************************************************
                                        ;*** SPARE FUNCTION ***
                                        ;*****************************************************************************
067776  000207                          TAG77$: RETURN

                                        ;*****************************************************************************
                                        ;*** UNKNOWN DATA ***
                                        ;*****************************************************************************
070000                                  TAG78$: TYPE    MSG061
070004  000207                                  RETURN

                                        ;*****************************************************************************
                                        ;*** PHYSICAL ADDRESS ***
                                        ;*****************************************************************************
070006  013737  002040  002044          TAG79$: MOV     ADDRESS,PHYADD
070014  162737  060000  002044                  SUB     #FIRST,PHYADD
070022  013737  002106  002046                  MOV     BANK,PHYADD+2
070030  006237  002046                          ASR     PHYADD+2
070034  103003                                  BCC     1$
070036  052737  100000  002044                  BIS     #BIT15,PHYADD
070044  012746  002044          1$:     MOV     #PHYADD,-(SP)           ;POINTER TO DOUBLE WORD ON STACK
070050  00473   075014                  CALL    $DB2O                   ;CALL DOUBLE PRECISION CONVERSION ROUTINE
070054  062706  000002                  ADD     #2,SP                   ;FIX STACK
070060                                  TYPE    $OCT8
070064  000207                          RETURN
                                        ;*****************************************************************************
                                        ;*** MARGIN ***
                                        ;*****************************************************************************
070066                                  TAG80$: TYPOCS  MARGIN,<TYPE (0,2,3,4, OR 5)>,1
070076  000207                          RETURN

                                        ;*****************************************************************************
                                        ;*** OCTAL BYTE ***
                                        ;*****************************************************************************
070100                                  TAG81$: TYPE    MSG018          ;2 SPACES
070104                                  TYPOCS  @(R1),<TYPE BYTE>,3,Z
070114                                  TYPE    MSG014          ;SPACE
070120  000207                          RETURN
```

```
                                ;*****************************************************************************
                                ;*** ARRAY ***
                                ;*****************************************************************************
                                        ;SOMETIMES THE ARRAY INFORMATION MAY BE MISLEADING
                                        ;  IF YOU ARE LOOKING FOR SBE'S (SWITCH 0 IS UP)
                                        ;    IF AN ERROR IS BEING REPORTED AND THE CODE THAT TYPES THE
                                        ;    ERROR HAS A SINGLE BIT ERROR
                                        ;      THE OLD SBE INFORMATION WILL BE WRITTEN OVER AND THE ARRAY
                                        ;      TYPED MAY BE THE ARRAY THAT HAS THE ERROR REPORT CODE IN IT
                                        ;      AND NOT THE ARRAY THAT WAS UNDER TEST AND THAT THE REST
                                        ;      OF THE ERROR REPORT IS TALKING ABOUT.
                                        ;      HOWEVER THE ARRAY IS STILL BAD (IF YOU'RE LOOKING FOR SBE'S).
070122  012737  037477  115336  TAG82$: MOV     #'??,MSG074
070130                                IF MKFLAG IS TRUE
070136                                  PUSH  CSR,CSR+2,R0,R1,R2,CSRNO
070160  013737  002000  002256          MOV   BADCSR,CSRNO
070166                                  SET   R2
070172  104426                          READCSR
070174                                  IF #BIT15!BIT4 SET.IN CSR
070204  013702  002144                    MOV CSR,R2
070210  072227  177774                    ASH #-4,R2
070214  042702  177761                    BIC #^C16,R2
070220                                    IF #BIT9 SET.IN CSR+2 THEN LFT R2 :  R2 SET.BY #BIT0
070234                                  END ;OF IF #BIT15.BIT4
070234                                  IF R2 GE #0
070240                                    IF R2 GT #9.
070246  162702  000012                      SUB       #10.,R2
070252  000302                            SWAB      R2
070254  062702  030061                      ADD       #'10,R2
070260                                    ELSE
070262  000302                            SWAB      R2
070264  062702  030040                      ADD       #' 0,R2
070270                                    END ;OF IF #BIT3
070270  010237  115336                    MOV R2,MSG074
070274                                  END ;OF IF R2
070274                                  POP   CSRNO,R2,R1,R0,CSR+2,CSR
070316                                END ;OF IF MKFLAG
070316                                TYPE    MSG074
070322  000207                        RETURN
```

```
 2501                                   ;*****************************************************************************
 2502                                   ;*** BINARY BYTE ***
 2503                                   ;*****************************************************************************
 2504 070324                            TAG83$: PUSH    R0,R2
 2505 070330                                    TYPE    MSG018          ;2 SPACES
 2506 070334  017100  000000                    MOV     @(R1),R0
 2507 070340                                    FOR R2 := #1 TO #8.
 2508 070344  106100                              ROLB  R0
 2509 070346                                      ON.ERROR
 2510 070350  112737  000061  112134                MOVB        #'1,MSG015
 2511 070356                                      ELSE
 2512 070360  112737  000060  112134                MOVB        #'0,MSG015
 2513 070366                                      END ;OF ON.ERROR
 2514 070366                                      TYPE  MSG015
 2515 070372                                    END ;OF FOR R2
 2516 070402                                    POP     R2,R0
 2517 070406  000207                            RETURN
 2518
 2519                                   ;*****************************************************************************
 2520                                   ;*** 4 BINARY BITS ***
 2521                                   ;*****************************************************************************
 2522 070410                            TAG84$: PUSH    R0,R2
 2523 070414                                    TYPE    MSG018          ;2 SPACES
 2524 070420  017100  000000                    MOV     @(R1),R0
 2525 070424  012702  000004                    MOV     #4,R2
 2526 070430  072002                            ASH     R2,R0           ;SHIFT 4 PLACES LEFT
 2527 070432                                    FOR R2 := #1 TO #4
 2528 070436  106100                              ROLB  R0
 2529 070440                                      ON.ERROR
 2530 070442  112737  000061  112134                MOVB        #'1,MSG015
 2531 070450                                      ELSE
 2532 070452  112737  000060  112134                MOVB        #'0,MSG015
 2533 070460                                      END ;OF ON.ERROR
 2534 070460                                      TYPE  MSG015
 2535 070464                                    END ;OF FOR R2
 2536 070474                                    POP     R2,R0
 2537 070500  000207                            RETURN
```

```
 2540                                   ;*****************************************************************************
 2541                                   ;*** ARRAY FROM SBE FROM OLD CSR ***
 2542                                   ;*****************************************************************************
 2543 070502                            TAG85$: PUSH    R2
 2544 070504  012737  037477  115336            MOV     #'??,MSG074
 2545 070512  013702  002150                    MOV     SBECSR,R2
 2546 070516  072227  177774                    ASH     #-4,R2
 2547 070522  042702  177761                    BIC     #^C16,R2
 2548 070526                                    IF #BIT9 SET.IN SBECSR+2 THEN LET R2 := R2 SET.BY #BIT0
 2549 070542                                    IF R2 GE #0
 2550 070546                                      IF R2 GT #9.
 2551 070554  162702  000012                        SUB #10.,R2
 2552 070560  000302                                SWAB        R2
 2553 070562  062702  030061                        ADD #'10,R2
 2554 070566                                      ELSE
 2555 070570  000302                                SWAB        R2
 2556 070572  062702  030040                        ADD #'' 0,R2
 2557 070576                                      END ;OF IF #BIT3
 2558 070576  010237  115336                      MOV   R2,MSG074
 2559 070602                                    END ;OF IF R2
 2560 070602                                    TYPE    MSG074
 2561 070606                                    POP     R2
 2562 070610  000207                            RETURN
 2563
 2564                                   ;*****************************************************************************
 2565                                   ;*** MASTER OR SLAVE1 OR SLAVE2 OR SLAVE3 FROM BAD
 2566                                   ;*****************************************************************************
 2567 070612                            TAG86$: IF BAD EQ #0
 2568 070620                                      TYPE  MSG113                  ;MASTER
 2569 070624                                    END IF
 2570 070624                                    IF BAD EQ #1
 2571 070634                                      TYPE  MSG114                  ;SLAVE1
 2572 070640                                    END IF
 2573 070640                                    IF BAD EQ #2
 2574 070650                                      TYPE  MSG115                  ;SLAVE2
 2575 070654                                    END IF
 2576 070654                                    IF BAD EQ #3
 2577 070664                                      TYPE  MSG116                  ;SLAVE3
 2578 070670                                    END IF
 2579 070670  000207                            RETURN
```

```
2581 070672                          WHOBOX: SUBTST  <<SUBR  WHO'S BOX IS THIS?>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        SUBR    WHO'S BOX IS THIS?
                                     ;*****************************************************************************
2582 070672  005737  002126                 TST     MKFLAG          ;MK11?
2583 070676  001003                         BNE     1$                      ;YES - SKIP
2584                                        ;NO - MJ11 - DON'T KNOW ABOUT BOX NUMBERS
2585 070700                                 TYPE    MSG057                  ; ?
2586 070704  000207                         RETURN
2587
2588 070706                          1$:    PUSH    CSRNO,R1,R2,R3,R4
2589 070722  005037  002424                 CLR     SUCCESS
2590 070726  012703  000200                 MOV     #200,R3
2591 070732  012701  000060                 MOV     #'0,R1
2592 070736                                 BEGIN WHODUNIT
2593 070736                                 FOR R4 := #0 TO #16 BY #2
2594 070740                                   IFB R3 SET.IN MKCSRS
2595 070746  016437  002214  002260             MOV CSRFB(R4),FIRSTB
2596 070754  016437  002234  002262             MOV CSRLB(R4),LASTB
2597 070762  010437  002000                     MOV R4,BADCSR
2598 070766  006337  002000                     ASL BADCSR
2599 070772                                     IF FIRSTB LE BANK AND LASTB GE BANK
2600 071012  016402  002174                       MOV       CSR2(R4),R2
2601 071016  072227  177764                       ASH       #-12.,R2
2602 071022  042702  177770                       BIC       #^C7,R2
2603 071026                                       CASE R2
2604 071036  071152                                 ADD..0
2605 071040  071162                                 ADD..1
2606 071042  071202                                 ADD..2
2607 071044  071232                                 ADD..3
2608 071046  071262                                 ADD..4
2609 071050  071264                                 ADD..5
2610 071052  071304                                 ADD..6
2611 071054  071334                                 ADD..7
2612 071056                                       END ;OF CASE R2
2613 071064                                       IF SUCCESS IS TRUE THEN LEAVE WHODUNIT
2614 071072                                     END ;OF IF FIRSTB
2615 071072                                   END ;OF IFB R3
2616 071072  006003                           ROR     R3
2617 071074  005201                           INC     R1
2618 071076                                 END ;OF FOR CSRNO
2619 071110                                 END WHODUNIT
2620 071110                                 IF SUCCESS IS TRUE
2621 071116  110137  114717                   MOVB  R1,MSG057+1
2622 071122                                 END ;OF IF SUCCESS
2623 071122                                 TYPE    MSG057
2624 071126  112737  000077  114717         MOVB    #'?,MSG057+1
2625 071134                                 POP     R4,R3,R2,R1,CSRNO
2626 071150  000207                         RETURN
```

```
2629 071152                                ADD..0: SET     SUCCESS
2630 071160  000207                                RETURN
2631 071162                                ADD..1: IF #BIT2 OFF.IN ADDRESS THEN LET SUCCESS := ONES
2632 071200  000207                                RETURN
2633 071202                                ADD..2: IF #BIT3 OFF.IN ADDRESS AND #BIT2 OFF.IN ADDRESS THEN LET SUCCESS := ONES
2634 071230  000207                                RETURN
2635 071232                                ADD..3: IF #BIT3 SET.IN ADDRESS AND #BIT2 OFF.IN ADDRESS THEN LET SUCCESS .= ONES
2636 071260  000207                                RETURN
2637 071262  000207                                ADD..4: RETURN
2638 071264                                ADD..5: IF #BIT2 SET.IN ADDRESS THEN LET SUCCESS := ONES
2639 071302  000207                                RETURN
2640 071304                                ADD..6: IF #BIT3 OFF.IN ADDRESS AND #BIT2 SET.IN ADDRESS THEN LET SUCCESS := ONES
2641 071332  000207                                RETURN
2642 071334                                ADD..7: IF #BIT3 SET.IN ADDRESS AND #BIT2 SET.IN ADDRESS THEN LET SUCCESS := ONES
2643 071362  000207                                RETURN
2644
2645 071364                                DETAIL: SUBTST  <<SUBR  DETAILED ERROR REPORT>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       SUBR    DETAILED ERROR REPORT
                                           ;*****************************************************************************
2646 071364  005237  002326                        INC     DETFLAG
2647 071370  022737  000003  002326                CMP     #3,DETFLAG
2648 071376  101465                                BLOS    4$
2649 071400  022737  000002  002326                CMP     #2,DETFLAG
2650 071406  001435                                BEQ     2$
2651 071410                                        PUSH    HEADER,MUT
2652 071420                                        SET     HEADER
2653 071426  005037  002116                        CLR     MUT
2654 071432  010037  002306                        MOV     R0,DETR0
2655 071436  012700  002310                        MOV     #DETR1,R0
2656 071442  010120                                MOV     R1,(R0)+
2657 071444  010220                                MOV     R2,(R0)+
2658 071446  010320                                MOV     R3,(R0)+
2659 071450  010420                                MOV     R4,(R0)+
2660 071452  010520                                MOV     R5,(R0)+
2661 071454  013720  002030                        MOV     ERRSP,(R0)+
2662 071460  013720  002034                        MOV     ERRPSW,(R0)+
2663 071464  013700  002306                        MOV     DETR0,R0
2664 071470                                        SET     NOERROR
2665 071476  104013                                ERROR   +13
2666 071500  000415                                BR      1$
2667 071502                                2$:     PUSH    HEADER,MUT
2668 071512                                        SET     HEADER
2669 071520  005037  002116                        CLR     MUT
2670 071524                                        SET     NOERROR
2671 071532  104031                                ERROR   +31
2672 071534                                1$:     POP     MUT,HEADER
2673                                               ;WARNING RECURSIVE
2674 071544  004737  071364                        CALL    DETAIL
2675 071550  000207                                RETURN
```

```
 2678                                        ;SIMULATE CONTROL ''T''
 2679 071552  004737  073404          4$:    CALL    CONTT                   ;DISPLAY 'DISPLAY'' INFO
 2680
 2681                                        ;TYPE CONTENTS OF ALL CSR'S
 2682 071556                                 PUSH    CSR,CSR+2,CSRNO,R1
 2683 071574                                 TYPE    MSG058
 2684 071600                                 TYPE    $CRLF
 2685 071604  013701  002334                 MOV     MKCSRS,R1
 2686 071610                                 BEGIN DUMPCSRLOOP
 2687 071610                                   FOR CSRNO := #0 TO #34 BY #4
 2688 071614  106301                             ASLB    R1
 2689 071616                                     ON.ERROR
 2690 071620  104426                               READCSR
 2691 071622                                       TYPOCT  CSR
 2692 071630                                       TYPE    MSG018          ;2 SPACES
 2693 071634                                       TYPOCT  CSR+2
 2694 071642                                       TYPE    MSG018          ;2 SPACES
 2695 071646                                     END ;OF ON.ERROR
 2696 071646                                     IFB R1 EQ #0 THEN LEAVE DUMPCSRLOOP
 2697 071652                                   END ;OF FOR CSRNO
 2698 071670                                 END DUMPCSRLOOP
 2699 071670                                 POP     R1,CSRNO,CSR+2,CSR
```

```
                                        ;TYPE STACKS
071706                                  PUSH    R0,R1
                                        ;TYPE KERNEL STACK
071712                                  TYPE    MSG088          ;KERNEL STACK
071716  013701  002706                  MOV     KSTACK,R1
071722  162701  000002                  SUB     #2,R1
071726                                  FOR     R0 := SP TO R1 BY #2
071730                                    TYPE  $CRLF
071734                                    TYPOCT        R0
071740                                    TYPE          MSG018          ;2 SPACES
071744                                    TYPOCT        (R0)
071750                                  END ;OF FOR R0
                                        ;TYPE SUPERVISOR STACK
071760  042737  030000  177776          BIC     #BIT13!BIT12,PSW        ;SET PREVIOUS MODE TO SUPERVISOR
071766  052737  010000  177776          BIS     #BIT12,PSW
071774  006506                          MFPI    SSP
071776                                  POP     R0
072000                                  TYPE    MSG089          ;SUPERVISOR STACK
072004                                  IF R0 LT #SUPSTK
072012                                    FOR R0 := R0 TO #SUPSTK-2 BY #2
072012                                      TYPE        $CRLF
072016                                      TYPOCT      R0
072022                                      TYPE        MSG018          ;2 SPACES
072026                                      TYPOCT      (R0)
072032                                    END ;OF FOR R0
072044                                  ELSE
072046                                    TYPE  MSG091          ;IS EMPTY
072052                                  END ;OF IF R0
                                        ;TYPE USER STACK
072052  052737  030000  177776          BIS     #BIT13!BIT12,PSW        ;SET PREVIOUS MODE TO USER
072060  006506                          MFPI    USP
072062                                  POP     R0
072064                                  TYPE    MSG090          ;USER STACK
072070                                  IF R0 LT #USESTK
072076                                    FOR R0 := R0 TO #USESTK-2 BY #2
072076                                      TYPE        $CRLF
072102                                      TYPOCT      R0
072106                                      TYPE        MSG018          ;2 SPACES
072112                                      TYPOCT      (R0)
072116                                    END ;OF FOR R0
072130                                  ELSE
072132                                    TYPE  MSG091          ;IS EMPTY
072136                                  END ;OF IF R0
072136                                  TYPE    $CRLF
072142  005037  002326                  CLR     DETFLAG
072146                                  POP     R1,R0
072152  000207                          RETURN
```

```
 2754 072154                            QUE:    SUBTST  <<QUE MESSAGES FROM SLAVE CPU'S>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       QUE MESSAGES FROM SLAVE CPU'S
                                        ;*****************************************************************************
 2755 072154  104410                            CKSWR
 2756 072156                                    PUSH    R0,R1,CONTRL
 2757 072166  104424                            CACHOFF                 ;TURN CACHE OFF
 2758 072170                                    FOR R0 :- #2 TO #6 BY #2
 2759 072174                                      IF PTYFLAG(R0) IS TRUE
 2760 072202  010001                                MOV     R0,R1
 2761 072204  006201                                ASR     R1
 2762 072206  062701  000060                        ADD     #'0,R1
 2763 072212  110137  116242                        MOVB    R1,MSGA98
 2764 072216                                        TYPE    MSG098          ;SLAVEN>        ;WHERE N = 1,2, OR 3
 2765 072222                            QUE1:       IFB PTYBUF(R0) NE #32   ;CONTROL Z?
 2766 072232                                          PUSH  PTYBUF(R0)
 2767 072236  005060  002626                          CLR   PTYFLAG(R0)
 2768 072242  004737  057076                          CALL  $TYPEC
 2769 072246  062706  000002                          ADD   #2,SP                     ;FIX STACK
 2770 072252  005760  002626            1$:           TST   PTYFLAG(R0)
 2771 072256  100375                                  BPL   1$
 2772 072260                                          GOTO  QUE1
 2773 072262                                        ELSE
 2774 072264                                          TYPE  MSG099                    ;MASTER>
 2775 072270  005060  002626                          CLR   PTYFLAG(R0)
 2776 072274                                          IF RLFLAG IS TRUE
 2777 072302                                            SET   SLAVERROR
 2778 072310  104000                                    ERROR                       ;LOG ERROR
 2779 072312  005037  002570                            CLR   SLAVERROR
 2780 072316                                          END ;OF IF RLFLAG IS TRUE
 2781 072316                                        END ;OF IF PTYBUF(R0)
 2782 072316                                      END ;OF IF PTYFLAG(R0)
 2783 072316                                    END ;OF FOR R0
 2784 072330                                    POP     CONTRL,R1,R0
 2785 072340  162737  000001  002574            SUB     #1,HUNGTIME             ;CARRY IS ERROR FLAG ON RETURN
 2786 072346  000207                            RETURN
```

```
                                        .SBTTL  ROUTINE BINARY TO OCTAL (ASCII) AND TYPE

                                ;*********************************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M=1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                ;*$TYPOS OR $TYPOC
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPON                   ;;CALL FOR TYPEOUT
                                ;*
                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOC                   ;;CALL FOR TYPEOUT

072350  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
072354  116637  000001  072573          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
072362  112637  072575          MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
072366  062716  000002          ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
072372  000406                  BR      $TYPON
072374  112737  000001  072573  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
072402  112737  000006  072575          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
072410  112737  000005  072572  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
072416  010346                  MOV     R3,-(SP)        ;;SAVE R3
072420  010446                  MOV     R4,-(SP)        ;;SAVE R4
072422  010546                  MOV     R5,-(SP)        ;;SAVE R5
072424  113704  072575          MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
072430  005404                  NEG     R4
072432  062704  000006          ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
072436  110437  072574          MOVB    R4,$OMODE       ;;SAVE IT FOR USE
072442  113704  072573          MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
072446  016605  000012          MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
072452  005003                  CLR     R3              ;;CLEAR THE OUTPUT WORD
072454  006105          1$:     ROL     R5              ;;ROTATE MSB INTO "C"
072456  000404                  BR      3$              ;;GO DO MSB
072460  006105          2$:     ROL     R5              ;;FORM THIS DIGIT
072462  006105                  ROL     R5
072464  006105                  ROL     R5
072466  010503                  MOV     R5,R3
072470  006103          3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
072472  105337  072574          DECB    $OMODE          ;;TYPE THIS DIGIT?
072476  100016                  BPL     6$              ;;BR IF NO
072500  042703  177770          BIC     #177770,R3      ;;GET RID OF JUNK
072504  001002                  BNE     4$              ;;TEST FOR 0
072506  005704                  TST     R4              ;;SUPPRESS THIS 0?
072510  001403                  BEQ     5$              ;;BR IF YES
072512  005204          4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
2846 072514  052703  000060            BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
2847 072520  052703  000040      5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
2848 072524  110337  072570            MOVB    R3,8$           ;;SAVE FOR TYPING
2849 072530                            TYPE    8$              ;;GO TYPE THIS DIGIT
2850 072534  105337  072572      6$:   DECB    $OCNT           ;;COUNT BY 1
2851 072540  003347                    BGT     2$              ;;BR IF MORE TO DO
2852 072542  002402                    BLT     7$              ;;BR IF DONE
2853 072544  005204                    INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
2854 072546  000744                    BR      2$              ;;GO DO THE LAST DIGIT
2855 072550  012605                7$: MOV     (SP)+,R5        ;;RESTORE R5
2856 072552  012604                    MOV     (SP)+,R4        ;;RESTORE R4
2857 072554  012603                    MOV     (SP)+,R3        ;;RESTORE R3
2858 072556  016666  000002  000004    MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
2859 072564  012616                    MOV     (SP)+,(SP)
2860 072566  000002                    RTI                     ;;RETURN
2861 072570     000      8$:   .BYTE   0               ;;STORAGE FOR ASCII DIGIT
2862 072571     000            .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
2863 072572     000      $OCNT: .BYTE   0               ;;OCTAL DIGIT COUNTER
2864 072573     000      $OFILL: .BYTE  0               ;;ZERO FILL SWITCH
2865 072574  000000      $OMODE: .WORD  0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                        .SBTTL  ROUTINE CONVERT BINARY TO DECIMAL AND TYPE
                                ;**************************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                                ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                                ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                                ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                                ;*REPLACED WITH SPACES.
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                                ;*      TYPDS                   ;;GO TO THE ROUTINE
072576                  $TYPDS: PUSH    R0,R1,R2,R3,R5
072610  012746  020200          MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
072614  016605  000020          MOV     20(SP),R5       ;;GET THE INPUT NUMBER
072620  100004                  BPL     1$              ;;BR IF INPUT IS POS.
072622  005405                  NEG     R5              ;;MAKE THE BINARY NUMBER POS.
072624  112766  000055  000001  MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
072632  005000          1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
072634  012703  073012          MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
072640  112723  000040          MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
072644  005002          2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
072646  016001  073002          MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
072652  160105          3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
072654  002402                  BLT     4$              ;;BR IF DONE
072656  005202                  INC     R2              ;;INCREASE THE BCD DIGIT BY 1
072660  000774                  BR      3$
072662  060105          4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
072664  005702                  TST     R2              ;;CHECK IF BCD DIGIT-0
072666  001002                  BNE     5$              ;;FALL THROUGH IF 0
072670  105716                  TSTB    (SP)            ;;STILL DOING LEADING 0'S?
072672  100407                  BMI     7$              ;;BR IF YES
072674  106316          5$:     ASLB    (SP)            ;;MSD?
072676  103003                  BCC     6$              ;;BR IF NO
072700  116663  000001  177777  MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
072706  052702  000060          BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
072712  052702  000040          BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
072716  110223                  MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
072720  005720                  TST     (R0)+           ;;JUST INCREMENTING
072722  020027  000010          CMP     R0,#10          ;;CHECK THE TABLE INDEX
072726  002746                  BLT     2$              ;;GO DO THE NEXT DIGIT
072730  003002                  BGT     8$              ;;GO TO EXIT
072732  010502                  MOV     R5,R2           ;;GET THE LSD
072734  000764                  BR      6$              ;;GO CHANGE TO ASCII
072736  105726          8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
072740  100003                  BPL     9$              ;;BR IF NO
072742  116663  177777  177776  MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
072750  105013          9$:     CLRB    (R3)            ;;SET THE TERMINATOR
072752                          POP     R5,R3,R2,R1,R0
072764                          TYPE    $DBLK           ;;NOW TYPE THE NUMBER
072770  016666  000002  000004  MOV     2(SP),4(SP)     ;;ADJUST THE STACK
072776  012616                  MOV     (SP)+,(SP)
073000  000002                  RTI                     ;;RETURN TO USER
073002  023420          $DTBL:  10000.
073004  001750                  1000.
073006  000144                  100.
073010  000012                  10.
073012  000000  000000  000000  $DBLK:  .WORD   0,0,0,0
073020  000000
```

```
                                        .SBTTL  ROUTINE TTY INPUT
                                ;*******************************************************************************
                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                ;*WHEN OPERATING IN TTY FLAG MODE.
                                        .ENABLE LSB
073022                          $CKSWR: IF CPUBIT NE #MASTER            ;SLAVES DON'T GET KEYBOARDS
073032  000002                            RTI
073034                                  END ;OF IF CPUBIT
073034  105777  107732                  TSTB    @$TKS           ;;CHAR THERE?
073040  100125                          BPL     12$             ;;IF NO, DON'T WAIT AROUND
073042  117746  107726                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
073046  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
073052  022716  000006          CONTS1: CMP     #6,(SP)         ;IS IT CONTROL F?
073056  001002                          BNE     1$              ;NO SKIP
073060  004737  043774                  CALL    FIELDSERVICE
073064  022716  000024          1$:     CMP     #24,(SP)        ;IS IT CONTROL T?
073070  001002                          BNE     16$             ;NO - SKIP
073072  004737  073404                  CALL    CONTT           ;YES - CALL CONTROL T ROUTINE
073076  022716  000003          16$:    CMP     #3,(SP)         ;IS IT CONTROL C?
073102  001451                          BEQ     5$              ;YES EXIT *****NOTE***** STACK IS SCREWED UP
073104  022716  000004                  CMP     #4,(SP)         ;IS IT CONTROL D?
073110  001002                          BNE     2$              ;NO - SKIP
073112  000137  075774          CONTP:  JMP     @#0.ODT         ;YES - GO TO ODT
073116  022716  000023          2$:     CMP     #23,(SP)        ;IS IT CONTROL S?
073122  001002                          BNE     6$              ;NO - SKIP
073124  004737  073544                  CALL    CONTS           ;YES - CALL CONTROL S ROUTINE
073130  022737  000176  002766  6$:     CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
073136  001067                          BNE     CKEND           ;;BRANCH IF NO
073140  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
073144  001064                          BNE     CKEND           ;;NO, RETURN TO USER
073146  005737  002066                  TST     $AUTO           ;ARE WE RUNNING IN AUTO-MODE?
073152  001061                          BNE     CKEND           ;BRANCH IF YES
073154                                  TYPE    $CNTLG          ;;ECHO THE CONTROL-G (^G)
073160                          $GTSWR: TYPE    $MSWR           ;;TYPE CURRENT CONTENTS
073164                                  TYPOCT  @SWR            ;;OF THE SWR
073172                                  TYPE    $MNEW           ;;PROMPT FOR NEW SWR
073176  005046                  3$:     CLR     -(SP)           ;;CLEAR COUNTER
073200  005046                          CLR     -(SP)           ;;THE NEW SWR
073202  105777  107564          4$:     TSTB    @$TKS           ;;CHAR THERE?
073206  100375                          BPL     4$              ;;IF NOT TRY AGAIN
073210  117746  107560                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
073214  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
073220  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
073224  001006                          BNE     7$              ;;BRANCH IF NOT
073226                          5$:     TYPE    $CNTLC          ;;YES, ECHO CONTROL-C (^C)
073232  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
073236  000137  043416                  JMP     BOOT            ;;CONTROL-C RESTART
073242  021627  000025          7$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
073246  001005                          BNE     9$              ;;BRANCH IF NOT
073250                                  TYPE    $CNTLU          ;;YES, ECHO CONTROL-U (^U)
073254  062706  000006          8$:     ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
073260  000746                          BR      3$              ;;LET'S TRY IT AGAIN
073262  021627  000015          9$:     CMP     (SP),#15        ;;IS IT A <CR>?
073266  001016                          BNE     13$             ;;BRANCH IF NO
073270  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
```

```
 2981 073274  001403                        BEQ     10$             ;;BRANCH IF YES
 2982 073276  016677  000002  107462        MOV     2(SP),@SWR      ;;SAVE NEW SWR
 2983 073304  062706  000006          10$:  ADD     #6,SP           ;;CLEAR UP STACK
 2984 073310                                TYPE    $CRLF           ;;ECHO <CR> AND <LF>
 2985 073314  000002                  12$:  RTI                     ;;RETURN
 2986 073316  062706  000002          CKEND: ADD     #2,SP           ;FIX STACK
 2987 073322  000002                        RTI                     ;RETURN
 2988 073324  004737  057076          13$:  CALL    $TYPEC          ;;ECHO CHAR
 2989 073330  021627  000060                CMP     (SP),#60        ;;CHAR < 0?
 2990 073334  002420                        BLT     15$             ;;BRANCH IF YES
 2991 073336  021627  000067                CMP     (SP),#67        ;;CHAR > 7?
 2992 073342  003015                        BGT     15$             ;;BRANCH IF YES
 2993 073344  042726  000060                BIC     #60,(SP)+       ;;STRIP-OFF ASCII
 2994 073350  005766  000002                TST     2(SP)           ;;IS THIS THE FIRST CHAR
 2995 073354  001403                        BEQ     14$             ;;BRANCH IF YES
 2996 073356  006316                        ASL     (SP)            ;;NO, SHIFT PRESENT
 2997 073360  006316                        ASL     (SP)            ;;    CHAR OVER TO MAKE
 2998 073362  006316                        ASL     (SP)            ;;    ROOM FOR NEW ONE.
 2999 073364  005266  000002          14$:  INC     2(SP)           ;;KEEP COUNT OF CHAR
 3000 073370  056616  177776                BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
 3001 073374  000702                        BR      4$              ;;GET THE NEXT ONE
 3002 073376                          15$:  TYPE    $QUES           ;;TYPE ?<CR><LF>
 3003 073402  000724                        BR      8$              ;;SIMULATE CONTROL-U
 3004                                       .DSABL  LSB
```

```
3007 073404                          CONTT:  SUBTST  <<CONTROL T>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        CONTROL T
                                     ;*****************************************************************************
3008 073404                                  PUSH    R0
3009 073406                                  TYPE    $CRLF
3010 073412                                  IF MDISPLAY LT #0 AND MDISPLAY GT #-256.
3011                                           ;WE ARE IN MULTIPROCESSOR MODE
3012 073430  013700  002676                    MOV   MDISPLAY,R0
3013 073434  005400                            NEG   R0
3014 073436                                    TYPE  MSG100                    ;MULTIPROCESSOR TEST #
3015 073442                                    TYPOCS        R0,,3             ;TYPE 3 DIGITS
3016 073450                                  ELSE
3017 073452                                    IF RLFLAG IS TRUE
3018 073460                                      TYPE        MSG092            ;RELOCATED
3019 073464                                    END ;OF IF RLFLAG
3020 073464                                    TYPE  MSG093                    ;BANK=
3021 073470                                    TYPOCS        BANK,,3           ;TYPE 3 DIGITS
3022 073500                                    TYPE  MSG094                    ;MAR=
3023 073504  013700  177750                    MOV   MAINT,R0
3024 073510  006200                            ASR   R0
3025 073512  042700  177770                    BIC   #^C7,R0
3026 073516                                    TYPOCS        R0,,1             ;TYPE 1 DIGIT
3027 073524                                    TYPE  MSG095                    ;PAT=
3028 073530                                    TYPOCS        REALPAT,,2        ;TYPE 2 DIGITS
3029 073540                                  END ;OF IF @DISPLAY
3030 073540                                  POP     R0
3031 073542  000207                          RETURN
3032
3033 073544                          CONTS:  SUBTST  <<CONTROL S & CONTROL Q>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        CONTROL S & CONTROL Q
                                     ;*****************************************************************************
3034 073544                                  POP     R0                ;GET RID OF RETURN ADDRESS FROM STACK
3035 073546  105777  107220          CONTS2: TSTB    @$TKS             ;WAIT FOR CHARACTER
3036 073552  100375                          BPL     CONTS2
3037 073554  117716  107214                  MOVB    @$TKB,(SP)        ;REPLACE OVER OLD CHARACTER ON STACK
3038 073560  042716  177600                  BIC     #^C177,(SP)       ;STRIP ALL BUT ASCII
3039 073564                                  IF (SP) EQ #21            ;IF IT IS A CONTROL Q
3040 073572  000137  073052                    JMP   CONTS1
3041 073576                                  ELSE
3042 073600  000762                            BR    CONTS2
3043 073602                                  END ;OF IF (SP)
```

```
                                ;*****************************************************************************
                                ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*CALL:
                                ;*      RDCHR                       ;;INPUT A SINGLE CHARACTER FROM THE TTY
                                ;*      RETURN HERE                 ;;CHARACTER IS ON THE STACK
                                ;*                                  ;;WITH PARITY BIT STRIPPED OFF
                                ;
073602  011646                  $RDCHR: MOV     (SP),-(SP)          ;;PUSH DOWN THE PC
073604  016666  000004  000C02          MOV     4(SP),2(SP)         ;;SAVE THE PS
073612  105777  107154          1$:     TSTB    @$TKS               ;;WAIT FOR
073616  100375                          BPL     1$                  ;;A CHARACTER
073620  117766  107150  000004          MOVB    @$TKB,4(SP)         ;;READ THE TTY
073626  042766  177600  000004          BIC     #^C<177>,4(SP)      ;;GET RID OF JUNK IF ANY
073634  026627  000004  000023          CMP     4(SP),#23           ;;IS IT A CONTROL-S?
073642  001013                          BNE     3$                  ;;BRANCH IF NO
073644  105777  107122          2$:     TSTB    @$TKS               ;;WAIT FOR A CHARACTER
073650  100375                          BPL     2$                  ;;LOOP UNTIL ITS THERE
073652  117746  107116                  MOVB    @$TKB,-(SP)         ;;GET CHARACTER
073656  042716  177600                  BIC     #^C177,(SP)         ;;MAKE IT 7-BIT ASCII
073662  022627  000021                  CMP     (SP)+,#21           ;;IS IT A CONTROL-Q?
073666  001366                          BNE     2$                  ;;IF NOT DISCARD IT
073670  000750                          BR      1$                  ;;YES, RESUME
073672  026627  000004  000140  3$:     CMP     4(SP),#140          ;;IS IT UPPER CASE?
073700  002407                          BLT     4$                  ;;BRANCH IF YES
073702  026627  000004  000175          CMP     4(SP),#175          ;;IS IT A SPECIAL CHAR?
073710  003003                          BGT     4$                  ;;BRANCH IF YES
073712  042766  000040  000004          BIC     #40,4(SP)           ;;MAKE IT UPPER CASE
073720  000002                  4$:     RTI                         ;;GO BACK TO USER
                                ;*****************************************************************************
                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                ;*CALL:
                                ;*      RDLIN                       ;;INPUT A STRING FROM THE TTY
                                ;*      RETURN HERE                 ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                ;*                                  ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
073722  010346                  $RDLIN: MOV     R3,-(SP)            ;;SAVE R3
073724  005046                          CLR     -(SP)               ;;CLEAR THE RUBOUT KEY
073726  012703  074200          1$:     MOV     #$TTYIN,R3          ;;GET ADDRESS
073732  022703  074224          2$:     CMP     #$TTYIN+20.,R3      ;;BUFFER FULL?
073736  101467                          BLOS    8$                  ;;BR IF YES
073740  104411                          RDCHR                       ;;GO READ ONE CHARACTER FROM THE TTY
073742  112613                          MOVB    (SP)+,(R3)          ;;GET CHARACTER
073744  122713  000003                  CMPB    #3,(R3)             ;;IS IT A CONTROL-C?
073750  001006                          BNE     3$                  ;;BRANCH IF NO
073752                                  TYPE    $CNTLC              ;;TYPE A CONTROL-C (^C)
073756  005726                          TST     (SP)+               ;;CLEAN RUBOUT KEY OFF OF THE STACK
073760  012603                          MOV     (SP)+,R3            ;;RESTORE R3
073762  000137  043416                  JMP     BOOT                ;;GOTO CONTROL-C RESTART
073766  122713  000177          3$:     CMPB    #177,(R3)           ;;IS IT A RUBOUT
073772  001022                          BNE     5$                  ;;BR IF NO
073774  005716                          TST     (SP)                ;;IS THIS THE FIRST RUBOUT?
073776  001007                          BNE     4$                  ;;BR IF NO
074000  112737  000134  074176          MOVB    #'\,10$             ;;TYPE A BACK SLASH
074006                                  TYPE    10$
074012  012716  177777                  MOV     #-1,(SP)            ;;SET THE RUBOUT KEY
074016  005303                  4$:     DEC     R3                  ;;BACKUP BY ONE
074020  020327  074200                  CMP     R3,#$TTYIN          ;;STACK EMPTY?
```

```
3102 074024  103434                        BLO     8$              ;;BR IF YES
3103 074026  111337  074176                MOVB    (R3),10$                ;;SETUP TO TYPEOUT THE DELETED CHAR.
3104 074032                                TYPE    10$             ;;GO TYPE
3105 074036  000735                        BR      2$              ;;GO READ ANOTHER CHAR.
3106 074040  005716                5$:     TST     (SP)            ;;RUBOUT KEY SET?
3107 074042  001406                        BEQ     6$              ;;BR IF NO
3108 074044  112737  000134  074176        MOVB    #'\,10$         ;;TYPE A BACK SLASH
3109 074052                                TYPE    10$
3110 074056  005016                        CLR     (SP)            ;;CLEAR THE RUBOUT KEY
3111 074060  122713  000025        6$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
3112 074064  001003                        BNE     7$              ;;BR IF NO
3113 074066                                TYPE    $CNTLU          ;;TYPE A CONTROL 'U'
3114 074072  000715                        BR      1$              ;;GO START OVER
3115 074074  122713  000022        7$:     CMPB    #22,(R3)        ;;IS CHARACTER A ''^R''?
3116 074100  001011                        BNE     9$              ;;BRANCH IF NO
3117 074102  105013                        CLRB    (R3)            ;;CLEAR THE CHARACTER
3118 074104                                TYPE    $CRLF           ;;TYPE A ''CR'' & 'LF''
3119 074110                                TYPE    $TTYIN          ;;TYPE THE INPUT STRING
3120 074114  000706                        BR      2$              ;;GO PICKUP ANOTHER CHACTER
3121 074116                        8$:     TYPE    $QUES           ;;TYPE A '?'
3122 074122  000701                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
3123 074124  111337  074176        9$:     MOVB    (R3),10$                ;;ECHO THE CHARACTER
3124 074130                                TYPE    10$
3125 074134  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
3126 074140  001274                        BNE     2$              ;;LOOP IF NOT RETURN
3127 074142  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
3128 074146                                TYPE    $LF             ;;TYPE A LINE FEED
3129 074152  005726                        TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
3130 074154  012603                        MOV     (SP)+,R3        ;;RESTORE R3
3131 074156  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
3132 074160  016666  000004  000002        MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
3133 074166  012766  074200  000004        MOV     #$TTYIN,4(SP)
3134 074174  000002                        RTI                     ;;RETURN
3135 074176     000                10$:    .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
3136 074177     000                        .BYTE   0               ;;TERMINATOR
3137 074200  000024                $TTYIN: .REPT   20.             ;;RESERVE SIZE BYTES FOR TTY INPUT
3140 074224     136     103     015 $CNTLC: .ASCIZ  /^C/<15><12>    ;;CONTROL 'C'
     074227     012     000
3141 074231     136     125     015 $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U'
     074234     012     000
3142 074236     136     107     015 $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL 'G'
     074241     012     000
3143 074243     015     012     123 $MSWR:  .ASCIZ  <15><12>/SWR = /
     074246     127     122     040
     074251     075     040     000
3144 074254     040     040     116 $MNEW:  .ASCIZ  /  NEW = /
     074257     105     127     040
     074262     075     040     000
3145                                       .EVEN
```

```
                                        .SBTTL  ROUTINE READ AN OCTAL NUMBER FROM THE TTY
                                ;*******************************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A '?' WILL BE TYPED
                                ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
074266  011646                  $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
074270  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
074276                                  PUSH    R0,R1,R2
074304  104412                  1$:     RDLIN                   ;;READ AN ASCIZ LINE
074306  012600                          MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
074310  010037  074414                  MOV     R0,5$           ;;AND SAVE IT
074314  005001                          CLR     R1              ;;CLEAR DATA WORD
074316  005002                          CLR     R2
074320  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
074322  001420                          BEQ     3$              ;;IF ZERO GET OUT
074324  122716  000060                  CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
074330  003026                          BGT     4$              ;;IS AN OCTAL DIGIT
074332  122716  000067                  CMPB    #'7,(SP)
074336  002423                          BLT     4$
074340  006301                          ASL     R1              ;;*2
074342  006102                          ROL     R2
074344  006301                          ASL     R1              ;;*4
074346  006102                          ROL     R2
074350  006301                          ASL     R1              ;;*8
074352  006102                          ROL     R2
074354  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
074360  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
074362  000756                          BR      2$              ;;LOOP
074364  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
074366  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
074372  010237  074434                  MOV     R2,$HIOCT
074376                                  POP     R2,R1,R0
074404  000002                          RTI                     ;;RETURN
074406  005726                  4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
074410  105010                          CLRB    (R0)            ;;SET A TERMINATOR
074412                                  TYPE                    ;;TYPE UP THRU THE BAD CHAR.
074414  000000                  5$:     .WORD   0
074416                                  TYPE    MSG062          ;INPUT MUST BE A
074422                                  TYPE    MSG063          ;N OCTAL
074426                                  TYPE    MSG064          ;NUMBER
074432  000724                          BR      1$              ;;TRY AGAIN
074434  000000                  $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
                                        .SBTTL  ROUTINE READ A DECIMAL NUMBER FROM THE TTY


                                ;*******************************************************************************
                                ;*THIS ROUTINE WILL READ A DECIMAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY. IF TOO MANY CHARACTERS OR ANY ILLEGAL CHARACTERS
                                ;*ARE READ A '?' FOLLOWED BY A CARRIAGE RETURN-LINE FEED WILL BE TYPED.
                                ;*THE COMPLETE NUMBER MUST BE RETYPED. THE INPUT IS TERMINATED BY THE
                                ;*USER TYPING A CARRIAGE RETURN. THE RANGE OF THE INPUT NUMBER IS
```

```
                                        ;*POSITIVE 32767 TO NEGATIVE 32768.
                                        ;*CALL:
                                        ;*      RDDEC                   ;;READ A DECIMAL NUMBER
                                        ;*      RETURN HERE             ;;NUMBER IS ON TOP OF THE STACK
                                        ;
074436  011646                 $RDDEC: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR
074440  016666  000004  000002         MOV     4(SP),2(SP)     ;;THE INPUT NUMBER
074446                                  PUSH    R0,R1,R2
074454  104412                 1$:     RDLIN                   ;;READ AN ASCIZ LINE
074456  012600                         MOV     (SP)+,R0        ;;ADDRESS OF 1ST CHAR.
074460  010037  074604                 MOV     R0,6$           ;;SAVE INCASE OF BAD INPUT
074464  005046                         CLR     -(SP)           ;;CLEAR DATA WORD
074466  005002                         CLR     R2              ;;SIGN SET POSITIVE
074470  122710  000055                 CMPB    #'-,(R0)        ;;SEE IF A MINUS SIGN WAS TYPED
074474  001001                         BNE     2$              ;;BR IF NO MINUS SIGN
074476  112002                         MOVB    (R0)+,R2        ;;SAVE FOR LATER USE
074500  112001                 2$:     MOVB    (R0)+,R1        ;;PICKUP THIS CHARACTER
074502  001424                         BEQ     3$              ;;GET OUT IF ZERO
074504  122701  000060                 CMPB    #'0,R1          ;;MAKE SURE THIS CHARACTER
074510  003032                         BGT     5$              ;;IS A DIGIT BETWEEN 0 & 9
074512  122701  000071                 CMPB    #'9,R1
074516  002427                         BLT     5$
074520  032716  170000                 BIT     #^C7777,(SP)    ;;DON'T LET NUMBER GET TO BIG
074524  001024                         BNE     5$              ;;BR IF NUMBER WOULD OVERFLOW
074526  006316                         ASL     (SP)            ;;*2
074530  011646                         MOV     (SP),-(SP)      ;;SAVE FOR LATER
074532  006316                         ASL     (SP)            ;;*4
074534  006316                         ASL     (SP)            ;;*8.
074536  062616                         ADD     (SP)+,(SP)      ;;*10.
074540  102416                         BVS     5$              ;;OVERFLOW ISN'T ALLOWED
074542  162701  000060                 SUB     #'0,R1          ;;STRIP AWAY THE ASCII JUNK
074546  060116                         ADD     R1,(SP)         ;;ADD IN THIS DIGIT
074550  102412                         BVS     5$              ;;OVERFLOW ISN'T ALLOWED
074552  000752                         BR      2$              ;;LOOP
074554  005702                 3$:     TST     R2              ;;CHECK IF NUMBER IS NEG
074556  001401                         BEQ     4$              ;;BR IF NO
074560  005416                         NEG     (SP)            ;;YES--NEGATE THE NUMBER
074562  012666  000012         4$:     MOV     (SP)+,12(SP)    ;;SAVE THE RESULT
074566                                  POP     R2,R1,R0
074574  000002                         RTI                     ;;RETURN

074576  005726                 5$:     TST     (SP)+           ;;CLEAN PARTIAL NUMBER FROM STACK
074600  105010                         CLRB    (R0)            ;;SET A TERMINATOR
074602                                 TYPE                    ;;TYPE THE INPUT UP TO BAD CHAR.
074604  000000                 6$:     .WORD   0               ;;POINTER GOES HERE
074606                                 TYPE    MSG062          ;INPUT MUSST BE A
074612                                 TYPE    MSG065          ;DECIMAL
074616                                 TYPE    MSG064          ;NUMBER
074622  000714                         BR      1$              ;;TRY AGAIN
```

```
                                        .SBTTL  ROUTINE SAVE AND RESTORE R0-R5

                                ;*******************************************************************************
                                ;*SAVE R0-R5
                                ;*CALL:
                                ;*      SAVREG
                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                ;*
                                ;*TOP---(+16)
                                ;* +2---(+18)
                                ;* +4---R5
                                ;* +6---R4
                                ;* +8---R3
                                ;*+10---R2
                                ;*+12---R1
                                ;*+14---R0

074624                          $SAVREG:
074624                                  PUSH    R0,R1,R2,R3,R4,R5
074640  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
074644  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
074650  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
074654  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
074660  000002                          RTI

                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
074662                          $RESREG:
074662  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
074666  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
074672  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
074676  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
074702                                  POP     R5,R4,R3,R2,R1,R0
074716  000002                          RTI
```

```
                                        .SBTTL  ROUTINE RANDOM NUMBER GENERATOR

                                ;*****************************************************************************
                                ;*THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
                                ;*WITH A RANGE OF 0 TO 2**(+33)-1.
                                ;*CALL:
                                ;*      CALL    $RAND           ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;RETURN HERE THE RANDOM
                                ;*                              ;;NUMBER WILL BE IN
                                ;*                              ;;$HINUM,$LONUM

074720                          $RAND:  PUSH    R0,R1,R2
074726  013700  002716                  MOV     SEEDLO,R0       ;SET R0 WITH LOW
074732  013701  002714                  MOV     SEEDHI,R1       ;SET R1 WITH HIGH
074736  012702  000007                  MOV     #7,R2           ;SET SHIFT COUNT
074742  006300                  1$:     ASL     R0              ;;SHIFT R0 LEFT AND
074744  006101                          ROL     R1              ;;ROTATE CARRY INTO R1 AND
074746  077203                          SOB     R2,1$
074750  063700  002716                  ADD     SEEDLO,R0       ;ADD NUMBER TO MAKE X 129
074754  005501                          ADC     R1              ;;PROPOGATE CARRY
074756  063701  002714                  ADD     SEEDHI,R1       ;ADD NUMBER TO MAKE X 129
074762  062700  001057                  ADD     #1057,R0        ;;ADD LOW CONSTANT
074766  005501                          ADC     R1              ;;PROPOGATE CARRY
074770  062701  047401                  ADD     #47401,R1       ;;ADD HIGH CONSTANT
074774  010037  002716                  MOV     R0,SEEDLO       ;SAVE R0
075000  010137  002714                  MOV     R1,SEEDHI       ;SAVE R1
075004                                  POP     R2,R1,R0
075012  000207                          RETURN
```

```
                                        .SBTTL  ROUTINE DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT
                                ;*******************************************************************************
                                ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
                                ;*UNSIGNED OCTAL ASCIZ NUMBER.
                                ;*CALL
                                ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                ;*      CALL    $DB20           ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK

075014  104415                  $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
075016  016601  000002                  MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
075022  012705  075133                  MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
075026  012704  000014                  MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
075032  012703  177770                  MOV     #^C7,R3         ;;MASK
075036  012100                          MOV     (R1)+,R0        ;;LOWER WORD
075040  012101                          MOV     (R1)+,R1        ;;HIGH WORD
075042  005002                          CLR     R2              ;;TERMINATOR
075044  110245                  1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
075046  010002                          MOV     R0,R2           ;;GET THIS DIGIT
075050  005304                          DEC     R4              ;;COUNT THIS CHARACTER
075052  003007                          BGT     3$              ;;BR IF NOT THE LAST DIGIT
075054  001405                          BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
075056  005205                          INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
075060  010566  000002                  MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
075064  104416                          RESREG                  ;;RESTORE ALL REGISTERS
075066  000207                          RETURN                  ;;RETURN TO USER
075070  006203                  2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
075072  006001                  3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
075074  006000                          ROR     R0              ;;      THE NEXT OCTAL DIGIT
075076  006001                          ROR     R1
075100  006000                          ROR     R0
075102  006001                          ROR     R1
075104  006000                          ROR     R0
075106  040302                          BIC     R3,R2           ;;MASK OUT ALL JUNK
075110  062702  000060                  ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
075114  000753                          BR      1$              ;;GO PUT IT IN THE DATA TABLE
075116  000016                  $OCTVL: .REPT   14.             ;;RESERVE DATA TABLE
        075122                  $OCT8=$OCTVL+4                  ;POINTER TO 11 DIGIT NUMBER
```

```
                                        .SBTTL  TABLES
                                        .SBTTL  APT MAILBOX-ETABLE
075134                          $MAIL:
075134  000000                  $MSGTY: .WORD   0       ;;MESSAGE TYPE CODE
075136  000000                  $FATAL: .WORD   0       ;;FATAL ERROR NUMBER (ERROR PC)
075140  000000                  $TESTN: .WORD   0       ;;TEST NUMBER (DISPLAY REGISTER)
075142  000000                  $PASS:  .WORD   0       ;;PASS COUNT
075144  000000                  $DEVCT: .WORD   0       ;;DEVICE COUNT
075146  000000                  $UNIT:  .WORD   0       ;;I/O UNIT NUMBER
075150  000000                  $MSGAD: .WORD   0       ;;MESSAGE ADDRESS
075152  000000                  $MSGLG: .WORD   0       ;;MESSAGE LENGTH
075154                          $ETABLE:                ;;APT ENVIRONMENT TABLE
075154     000                  $ENV:   .BYTE   0       ;;ENVIRONMENT BYTE      ;SET TO A 1 FOR APT AUTO MODE
075155     000                  $ENVM:  .BYTE   0       ;ENVIRONMENT MODE
                                                        ;BIT7(200)=USE APT SIZE INFO ;BIT5(40)=NO CONSOLE
075156  000001                  $SWREG: .WORD   1       ;;APT SWITCH REGISTER
075160  000000                  $USWR:  .WORD   0       ;USED TO LIMIT THE NUMBER OF PASSES
075162  030400                  $CPUOP: .WORD   30400   ;;CPU TYPE,OPTIONS
                                                        BITS 15-11=CPU TYPE
                                                        ;*
                                                        ;*                      11/04=01,11/05=02,11/20=03,11/40 04,11/45 05
                                                        ;*                      11/70=06,PDQ=07,Q=10
                                                        ;*
                                                        BIT 10=REAL TIME CLOCK
                                                        BIT  9=FLOATING POINT PROCESSOR
                                                        BIT  8=MEMORY MANAGEMENT
075164     001                  $MAMS1: .BYTE   1       ;;HIGH ADDRESS,M.S. BYTE ;DEFAULT   64K
075165     004                  $MTYP1: .BYTE   4       ;;MEM. TYPE,BLK#1
                                                        ;*
                                                        MEM.TYPE BYTE   --  (HIGH BYTE)
                                                        ;*                      900 NSEC CORE=001
                                                        ;*                      300 NSEC BIPOLAR=002
                                                        ;*                      500 NSEC MOS=003
                                                        ;*                      MK11 ERROR CORRECTING MOS 004
075166  177776                  $MADR1: .WORD   177776  ;;HIGH ADDRESS,BLK#1
                                                        ;*                      MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF ''TYPE'' ABOVE
075170     000                  $MAMS2: .BYTE   0       ;;HIGH ADDRESS,M.S. BYTE
075171     000                  $MTYP2: .BYTE   0       ;;MEM.TYPE,BLK#2
075172  000000                  $MADR2: .WORD   0       ;;MEM.LAST ADDRESS,BLK#2
075174     000                  $MAMS3: .BYTE   0       ;;HIGH ADDRESS,M.S.BYTE
075175     000                  $MTYP3: .BYTE   0       ;;MEM.TYPE,BLK#3
075176  000000                  $MADR3: .WORD   0       ;;MEM.LAST ADDRESS,BLK#3
075200     000                  $MAMS4: .BYTE   0       ;;HIGH ADDRESS,M.S.BYTE
075201     000                  $MTYP4: .BYTE   0       ;;MEM.TYPE,BLK#4
075202  000000                  $MADR4: .WORD   0       ;;MEM.LAST ADDRESS,BLK#4
075204  000000                  $VECT1: .WORD   0       ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
075206  000000                  $VECT2: .WORD   0       ;;INTERRUPT VECTOR#2BUS PRIORITY#2
075210  000000                  $BASE:  .WORD   0       ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
075212  000000                  $DEVM:  .WORD   0       ;;DEVICE MAP

                                ;IF EITHOR OF THESE 2 WORDS ARE NON ZERO
                                ;THEY WILL BE LOADED INTO ALL CSR'S & THE PROGRAM WILL STOP
075214  000000                  $CDW1:  .WORD   0       ;CSR
075216  000000                  $CDW2:  .WORD   0       ;CSR+2

                                ;THE FOLLOWING LOCATIONS SPECIFY WHICH PATTERNS
                                ;ARE TO BE RUN FOR PARTICULAR MEMORIES
                                ;
                                ;REFERENCE THE TABLE LISTED BELOW TO RELATE BITS TO PATTERNS.
```

```
                                        ;BIT0 SET WILL RUN THE FIRST ENTRY IN THE TABLE, BIT0 SET
                                        ;IN THE SECOND WORD WILL RUN THE 17TH ENTRY IN THE TABLE ...
                                        ;
                                        ;NOTE** NULL TESTS DO NOT TAKE ANY TIME
                                        ;
075220  177777                          $DDW0:  .WORD   177777  ;MK11 CSR TESTS         TABLE = MKCSRT:
075222  177777                          $DDW1:  .WORD   177777  ;MK11 CSR TESTS         TABLE = MKCSRT:
075224  102777                          $DDW2:  .WORD   102777  ;MK11 PATTERNS          TABLE = MKPAT:
075226  177777                          $DDW3:  .WORD   177777  ;MK11 PATTERNS          TABLE = MKPAT:
075230  103777                          $DDW4:  .WORD   103777  ;MJ11 PATTERNS          TABLE = MJPAT:
075232  177777                          $DDW5:  .WORD   177777  ;MJ11 PATTERNS          TABLE = MJPAT:
075234  000001                          $DDW6:  .WORD   1       ;NUMBER OF CPU'S
075236                                  $ETEND:
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.
                                        
075236                                  $APTHD:
075236  000000                          $HIBTS: .WORD   0               ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
075240  075134                          $MBADR: .WORD   $MAIL           ;;ADDRESS OF APT MAILBOX (BITS 0-15)
075242  000010                          $TSTM:  .WORD   8.              ;;RUN TIM OF LONGEST TEST
075244  000144                          $PASTM: .WORD   100.            ;;RUN TIME IN SECS. OF 1ST PASS ON 128K (QUICK VERIFY)
075246  0003'0                         $UNITM: .WORD   200.            ;;ADDITIONAL RUN TIME OF A PASS FOR EACH ADDITIONAL 128K
075250  000041                                  .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                                        .SBTTL  ROUTINE TRAP DECODER

                                ;*********************************************************************
                                ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE ''TRAP'' INSTRUCTION
                                ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                ;*GO TO THAT ROUTINE.

075252  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
075254  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
075260  005740                          TST     -(R0)           ;;BACKUP BY 2
075262  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
075264  006300                          ASL     R0              ;;POSITION FOR INDEXING
075266  016000  075314                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
075272  000200                          RTS     R0              ;;GO TO ROUTINE

                                ;;THIS IS USE TO HANDLE THE ''GETPRI'' MACRO

075274  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
075276  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
075304  000002                          RTI                     ;;RESTORE THE PSW

075306                          $NOTRAP:TYPE    MSG006          ;UNDEFINED TRAP INSTRUCTION
075312  000000                  $HALT2: HALT
```

```
                                        .SBTTL  TRAP TABLE

                                ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                ;*BY THE ''TRAP'' INSTRUCTION.

                                ;       ROUTINE
                                ;       -------
075314  075274                  $TRPAD: .WORD   $TRAP2
075316  056752                          $TYPE   ;CALL=TYPEIT    TRAP+1(104401)  TTY TYPEOUT ROUTINE
075320  072374                          $TYPOC  ;CALL=TYPOC     TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
075322  072350                          $TYPOS  ;CALL=TYPOS     TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
075324  075306                          $NOTRAP;$TYPON  ;CALL=TYPON     TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST (A...)
075326  072576                          $TYPDS  ;CALL=TYPDS     TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
075330  075306                          $NOTRAP;$TYPBN  ;CALL=TYPBN     TRAP+6(104406)  TYPE BINARY (ASCII) NUMBER

075332  073160                          $GTSWR  ;CALL=GTSWR     TRAP+7(104407)  GET SOFT-SWR SETTING
075334  073022                          $CKSWR  ;CALL=CKSWR     TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR

075336  073602                          $RDCHR  ;CALL=RDCHR     TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE
075340  073722                          $RDLIN  ;CALL=RDLIN     TRAP+12(104412) TTY TYPEIN STRING ROUTINE
075342  074266                          $RDOCT  ;CALL=RDOCT     TRAP+13(104413) READ AN OCTAL NUMBER FROM TTY
075344  074436                          $RDDEC  ;CALL=RDDEC     TRAP+14(104414) READ A DECIMAL NUMBER FROM TTY

075346  074624                          $SAVREG ;CALL=SAVREG    TRAP+15(104415) SAVE R0-R5 ROUTINE
075350  074662                          $RESREG ;CALL=RESREG    TRAP+16(104406) RESTORE R0-R5 ROUTINE

075352  037020                          $KERNEL  ;CALL=KERNEL   TRAP+17(104417) ENTER KERNEL MODE
075354  037030                          $ENERGIZE;CALL=ENERGIZETRAP+20(104420) TURN ON MEMORY MANAGEMENT & TRAPS
075356  037040                          $DEENERGI;CALL=DEENERGITRAP+21(104421) TURN OFF MEMORY MENAGEMENT & TRAPS

075360  041016                          $KMAP    ;CALL=KMAP     TRAP+22(104422) MAP KERNEL 1 TO 1

075362  037050                          $CACHN  ;CALL=CACHON    TRAP+23(104423) TURN CACHE ON
075364  037066                          $CACHF  ;CALL=CACHOFF   TRAP+24(104424) TURN CACHE OFF

075366  037076                          $LOADC  ;CALL=LOADCSR   TRAP+25(104425) LOAD CORRECT CSR
075370  037220                          $READC  ;CALL=READCSR   TRAP+26(104426) READ CORRECT CSR

075372  064574                          $PER01  ;CALL=PERR01    TRAP+27(104427) PROGRAM DETECTED ERROR
075374  064622                          $PER02  ;CALL=PERR02    TRAP+30(104430) PROGRAM DETECTED ERROR
075376  064650                          $PER03  ;CALL=PERR03    TRAP+31(104431) PROGRAM DETECTED ERROR
075400  064700                          $PER04  ;CALL=PERR04    TRAP+32(104432) PROGRAM DETECTED ERROR
075402  064762                          $PER07  ;CALL=PERR07    TRAP+33(104433) PROGRAM DETECTED ERROR
075404  065004                          $PER10  ;CALL=PERR10    TRAP+34(104434) PROGRAM DETECTED ERROR
075406  065034                          $PER11  ;CALL=PERR11    TRAP+35(104435) PROGRAM DETECTED ERROR
075410  065054                          $PER12  ;CALL=PERR12    TRAP+36(104436) PROGRAM DETECTED ERROR
075412  065076                          $PER13  ;CALL=PERR13    TRAP+37(104437) PROGRAM DETECTED ERROR
075414  065116                          $PER14  ;CALL=PERR14    TRAP+40(104440) PROGRAM DETECTED ERROR
075416  065140                          $PER15  ;CALL=PERR15    TRAP+41(104441) PROGRAM DETECTED ERROR
075420  065162                          $PER16  ;CALL=PERR16    TRAP+42(104442) PROGRAM DETECTED ERROR
075422  065202                          $PER17  ;CALL=PERR17    TRAP+43(104443) PROGRAM DETECTED ERROR
075424  065220                          $PER20  ;CALL=PERR20    TRAP+44(104444) PROGRAM DETECTED ERROR
075426  065236                          $PER21  ;CALL=PERR21    TRAP+45(104445) PROGRAM DETECTED ERROR
075430  065256                          $PER22  ;CALL=PERR22    TRAP+46(104446) PROGRAM DETECTED ERROR
075432  065274                          $PER23  ;CALL=PERR23    TRAP+47(104447) PROGRAM DETECTED ERROR
075434  065312                          $PER24  ;CALL=PERR24    TRAP+50(104450) PROGRAM DETECTED ERROR
075436  054570                          $PER25  ;CALL-PERR25    TRAP+51(104451) PROGRAM DETECTED ERROR
```

```
3528 075440  065502    $PER26  ;CALL=PERR26     TRAP+52(104452) PROGRAM DETECTED ERROR
3529 075442  065522    $PER27  ;CALL=PERR27     TRAP+53(104453) PROGRAM DETECTED ERROR
3530 075444  054762    $PER30  ;CALL=PERR30     TRAP+54(104454) PROGRAM DETECTED ERROR
3531 075446  065720    $PER31  ;CALL=PERR31     TRAP+55(104455) PROGRAM DETECTED ERROR
3532 075450  066016    $PER32  ;CALL=PERR32     TRAP+56(104456) PROGRAM DETECTED ERROR
3533 075452  066064    $PER33  ;CALL=PERR33     TRAP+57(104457) PROGRAM DETECTED ERROR
3534 075454  066144    $PER34  ;CALL=PERR34     TRAP+60(104460) PROGRAM DETECTED ERROR
3535 075456  066176    $PER35  ;CALL=PERR35     TRAP+61(104461) PROGRAM DETECTED ERROR
3536 075460  075306    $NOTRAP ;CALL=PERR36     TRAP+62(104462) PROGRAM DETECTED ERROR
3537 075462  075306    $NOTRAP ;CALL=PERR37     TRAP+63(104463) PROGRAM DETECTED ERROR
3538 075464  075306    $NOTRAP ;CALL=PERR40     TRAP+64(104464) PROGRAM DETECTED ERROR
3539 075466  075306    $NOTRAP ;CALL=PERR41     TRAP+65(104465) PROGRAM DETECTED ERROR
3540 075470  075306    $NOTRAP ;CALL=PERR42     TRAP+66(104466) PROGRAM DETECTED ERROR
3541 075472  075306    $NOTRAP ;CALL=PERR43     TRAP+67(104467) PROGRAM DETECTED ERROR
3542
3543 075474  037466    $ECCDIS ;CALL=ECCDIS     TRAP+70(104470) DISABLE ECC ON ALL CSR'S
3544 075476  037522    $ECC1DIS;CALL=ECC1DIS    TRAP+71(104471) DISABLE ECC ON 1 SELECTED CSR
3545 075500  037554    $ECCINIT;CALL=ECCINIT    TRAP+72(104472) INITIALIZE ALL MK11 CSR'S
3546 075502  037574    $ECC1INIT;CALL=ECC1INIT  TRAP+73(104473) INITIALIZE 1 SELECTED MK11 CSR
3547 075504  037700    $CBCSR  ;CALL=CBCSR      TRAP+74(104474) WRITE GENERATED CHECKBITS IN ALL CSR'S
3548 075506  037742    $CB1CSR ;CALL=CB1CSR     TRAP+75(104475) WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
3549 075510  040002    $WASSBE ;CALL=WASSBE     TRAP+76(104476) WAS THERE A SBE ON ANY CSR?
3550 075512  040116    $WAS1SBE;CALL=WAS1SBE    TRAP+77(104477) WAS THERE A SBE ON 1 SELECTED CSR?
3551 075514  040146    $WASDBE ;CALL=WASDBE     TRAP+100(104500)WAS THERE A DBE ON ANY CSR?
3552 075516  040262    $WAS1DBE;CALL=WAS1DBE    TRAP+101(104501)WAS THERE A DBE ON 1 SELECTED CSR?
3553 075520  040322    $CLRCSR ;CALL=CLRCSR     TRAP+102(104502)CLEAR ALL CSR'S
3554 075522  040340    $CLR1CSR;CALL=CLR1CSR    TRAP+103(104503)CLEAR 1 SELECTED CSR
3555 075524  040354    $CHKDIS ;CALL=CHKDIS     TRAP+104(104504)DISABLE ECC & WRITE CKBITS FROM ALL CSR'S
3556 075526  040410    $CHK1DIS;CALL=CHK1DIS    TRAP+105(104505)DISABLE ECC & WRITE CKBITS FROM 1 CSR
3557 075530  037612    $ENASBE ;CALL=ENASBE     TRAP+106(104506)ENABLE TRAPS ON SBE'S FROM ALL CSR'S
3558 075532  037646    $ENA1SBE;CALL=ENA1SBE    TRAP+107(104507)ENABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
3559 075534  037310    $TSTRD  ;CALL=TSTREAD    TRAP+110(104510)TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES
3560 075536  040510    $INVALID;CALL=INVALID    TRAP+111(104511)INVALIDATE BACKGROUND PATTERN ON BANK
3561 075540  075306    $NOTRAP
3562 075542  075306    $NOTRAP
3563 075544  075306    $NOTRAP
3564 075546  075306    $NOTRAP
3565 075550  075306    $NOTRAP
3566 075552  075306    $NOTRAP
3567 075554  075306    $NOTRAP
3568 075556  075306    $NOTRAP
```

```
                                        .SBTTL ODT (CEMKA) DATA AREA
177776          ST      -       177776          ;STATUS REGISTER
000016          O.BKP   =       16              ;NUMBER OF BREAKPOINTS-1 MULT. BY 2
000014          O.TVEC  =       14              ;TRT VECTOR LOCATION
000340          O.STM   -       340             ;PRIORITY MASK - STATUS REGISTER
000020          O.TBT   -       20              ;T-BIT MASK - STATUS REGISTER
000003          TRT     =       000003          ;TRT INSTRUCTION
177562          O.RDB   =       177562          ;R DATA BUFFER
177560          O.RCSR  -       177560          ;R C/SR
177566          O.TDB           177566          ;T DATA BUFFER
177564          O.TCSR          177564          ;T C/SR
```

```
3585 075560  000000                O.CAD:  0                ; CURRENT ADDRESS
3586 075562  000000                O.DOT:  0                ; ORIGIN ADDRESS
3587 075564  000000                O.XXX:  .WORD   0        ;TEMPORARY STORAGE
3588 075566  000000                O.BW:   .WORD   0        ; =0 - ALL CLOSED
3589                                                        ; =1 - BYTE OPEN,
3590                                                        ; -2 - WORD OPEN
3591 075570      000               O.SEQ:  .BYTE   0        ;CHANGE SEQUENCE INDICATOR
3592 075571      000               O.S:    .BYTE   0        ;SINGLE INSTRUCTION FLAG
3593                                                        ;0 IF NOT ACTIVE
3594                                                        ;-1 IF ACTIVE
3595                                                        ;NO BREAK POINTS MAY BE SET WHILE IN
3596                                                        ;SINGLE INSTRUCTION MODE
3597 075572      000               O.T:    .BYTE   0        ;  T-BIT FLAG
3598 075573      000               O.P:    .BYTE   0        ;PROCEED FLAG = -2 IF MANUAL ENTRY
3599                                                        ;                -1 IF NO PROCEED ALLOWED
3600                                                        ;                0-7 IF PCEED ALLOWED
3601 075574      000               O.CSR1: .BYTE   0        ;SAVE CELL - R C/SR
3602 075575      000               O.CSR2: .BYTE   0        ;SAVE CELL - T C/SR
3603 075576  000000                O.FIL:  0                ;FILL COUNTER
3604 075600      000               O.CMFD: .BYTE   0        ;COMMA FOUND SWITCH, -0 NO COMMA FOUND
3605                                                        ;                    1 COMMA FOUND
3606 075601      000               O.SMFD: .BYTE   0        ;SEMICOLON FOUND SWITCH
3607                                                        ;=0 NO SEMICOLON FOUND
3608                                                        ;=1 SEMICOLON FOUND
3609 075602      000               O.SCRN: .BYTE   0        ;FLAG; 1=PASS SPACES ON FROM TTY
3610                                                        ;ALSO, IF =1, <LF> IS ECHOED
3611 075603      000               O.MINS: .BYTE   0        ;MINUS SIGN TYPED  (SWITCH)
3612                                                        ;0=NO MINUS TYPED;  1-MINUS SIGN TYPED
3613 075604  000000                O.BIAS: .WORD   0        ;CURRENT RELOCATION BIAS
```

```
                                        ;THE ORDER OF THE FOLLOWING ENTRIES IS CRITICAL
                    000026                      .REPT   26.
075662  000000      0.UR0:  0           ;USER R0
075664  000000              0           ;      R1
075666  000000              0           ;      R2
075670  000000              0           ;      R3
075672  000000              0           ;      R4
075674  000000              0           ;      R5
075676  000000      0.USP:  0           ;USER SP
075700  000000      0.UPC:  0           ;USER PC
075702  000000      0.UST:  0           ;USER ST
075704  000007      0.PRI:  7           ;ODT PRIORITY
                    ; BREAK POINT LISTS, ADR1 - ADDRESS OF BREAKPOINT,CT = COUNT,
                    ;   UIN = CONTENTS

075706              0.ADR1:
                    075730              .=.+0.BKP+4
075730              0.CT:
                    075752              . .+0.BKP+4
075752              0.UIN:
                    075774              .=.+0.BKP+4
075774              SLAVEND:;!..!...!.......!...THIS IS THE LIMIT OF SLAVE UNIQUE CODE
```

```
                                        ; INITIALIZE ODT
                                        ;  USE 0.ODT FOR A NORMAL ENTRY
                                        ;  USE 0.ODT+2 TO RESTART ODT - WIPING OUT ALL BREAKPOINTS
                                        ;  USE 0.ODT+4 TO RE-ENTER (I.E. - FAKE A BREAKPOINT)
                                        
075774  000421                  0.ODT:  BR      2$              ;NORMAL ENTRY
075776  000440                          BR      3$              ;RESTART
076000  004737  101172          1$:     JSR     PC,0.RRST       ;RE-ENTER  --  SAVE STATUS
076004  013746  000016                  MOV     0.TVEC+2,-(SP)  ;SET UP LOCAL STATUS
076010  004737  101202                  JSR     PC,0.WST
076014  010746                          MOV     PC,-(SP)        ;FAKE THE PC
076016  012637  075700                  MOV     (SP)+,0.UPC
076022  112737  177777  075573          MOVB    #-1,0.P         ;DISALLOW PROCEED
076030  105037  075571                  CLRB    0.S
076034  000137  100060                  JMP     0.BK1
                                        
                                        ;RUN AT CURRENT STATUS
076040  004537  100500          2$:     JSR     5,0.SVTT        ;SAVE TTY STATUS
076044  012737  076000  073114          MOV     #1$,@#CONTP+2
076052  004037  100360                  JSR     0,0.SVR         ;SAVE REGISTERS (MAINLY SP)
076056  012706  075662                  MOV     #0.UR0,SP       ;SET UP STACK
076062  012704  101300                  MOV     #0.ID,R4        ;TYPE ID
076066  012703  101315                  MOV     #0.IDND,R3
076072  004537  101126                  JSR     5,0.TYPE
076076  000414                          BR      4$
076100  004037  100360          3$:     JSR     0,0.SVR         ;SAVE REGISTERS
076104  004537  100602                  JSR     5,0.REM         ;REMOVE ALL BREAKPOINTS
076110  113704  075704                  MOVB    0.PRI,R4        ;GET ODT PRIORITY
076114  106004                          RORB    R4              ;SHIFT
076116  106004                          RORB    R4              ; INTO
076120  106004                          RORB    R4              ;  POSITION
076122  010446                          MOV     R4,-(SP)        ;STORE IN STATUS
076124  004737  101202                  JSR     PC,0.WST
076130  105037  075571          4$:     CLRB    0.S             ;DISABLE SINGLE INSTRUCTION FOR NOW
076134  112737  177777  075573          MOVB    #-1,0.P         ;DISALLOW PROCEED
076142  012737  000340  000016          MOV     #0.STM,0.TVEC+2 ;STATUS WORD TO TRT VECTOR+2
076150  012737  100042  000014          MOV     #0.BRK,0.TVEC   ;PC TO TRT VECTOR
076156  000137  077430                  JMP     0.RALL          ;CLEAR BRK PT TABLES
                                        ;
                                        ;0.CTLC
                                        ;       ^C PROCESSING. RETURN TO KEYBOARD MONITOR
                                        ;
                                        ;
076162  013706  075676          0.CTLC: MOV     0.USP,SP        ;RESTORE USER STACK
076166  012704  076206                  MOV     #1$,R4
076172  012703  076207                  MOV     #2$,R3
076176  004537  101126                  JSR     R5,0.TYPE       ;ECHO '^C'
076202  000137  043416                  JMP     BOOT
076206     136          1$:     .BYTE '^
076207     103          2$:     .BYTE 'C
```

```
3694                                    ;CONTROL F PROCESSING
3695 076210  013706  075676             O.CTLF: MOV     O.USP,SP        ;RESTORE USER STACK
3696 076214  012704  076240                     MOV     #1$,R4
3697 076220  012703  076241                     MOV     #2$,R3
3698 076224  004537  101126                     JSR     R5,O.TYPE       ;ECHO ^F
3699 076230  004737  043774                     CALL    FIELDSERVICE
3700 076234  000137  075774                     JMP     O.ODT
3701 076240     136                     1$:     .BYTE   '^
3702 076241     106                     2$:     .BYTE   'F
3703
3704                                    ;CONTROL E PROCESSING
3705 076242  012704  076266             O.CTLE: MOV     #1$,R4
3706 076246  012703  076267                     MOV     #2$,R3
3707 076252  004537  101126                     JSR     R5,O.TYPE       ;ECHO ^E
3708 076256  012705  073116                     MOV     #CONTP+4,R5
3709 076262  000137  077624                     JMP     O.GOGO
3710 076266     136                     1$:     .BYTE   '^
3711 076267     105                     2$:     .BYTE   'E
3712
3713                                    ; SPECIAL NAME HANDLER
3714                                    ;  DEPENDS UPON THE EXPLICIT ORDER OF THE TWO TABLES O.TL AND O.URO
3715
3716 076270  004537  101006             O.REGT: JSR     5,O.GET         ;SPECIAL NAME, GET ONE MORE CHARACTER
3717 076274  012704  101345                     MOV     #O.TL,R4        ;TABLE START ADDRESS
3718 076300  120024                     1$:     CMPB    R0,(R4)+        ;IS THIS THE CORRECT CHARACTER?
3719 076302  001414                             BEQ     3$              ;JUMP IF YES
3720 076304  022704  101365                     CMP     #O.TL+O.LG,R4   ;IS THE SEARCH DONE?
3721 076310  101373                             BHI     1$              ;BRANCH IF NOT
3722 076312  042700  177770                     BIC     #177770,R0      ;MASK OFF OCTAL
3723 076316  010004                             MOV     R0,R4
3724 076320  006304                     2$:     ASL     R4
3725 076322  062704  075662                     ADD     #O.URO,R4       ;GENERATE ADDRESS
3726 076326  005202                             INC     R2              ;SET FOUND FLAG
3727 076330  000137  076554                     JMP     O.SCAN          ;GO FIND NEXT CHARACTER
3728 076334  162704  101336             3$:     SUB     #O.TL-7,R4      ;GO FIND NEXT CHARACTER
3729 076340  000767                             BR      2$
```

```
3732                                    ; 'BACKARROW'' HANDLER - OPEN INDEXED ON THE PC (BACK ARROW)
3733                                            .ENABL  LSB
3734 076342  004537  076416            O.ORPC: JSR     5,2$            ;TEST WORD MODE AND CLOSE
3735 076346  061202                            ADD     @R2,R2          ;COMPUTE
3736 076350  005202                            INC     R2
3737 076352  005202                            INC     R2              ;   NEW ADDRESS
3738 076354  010237  075560            1$:     MOV     R2,O.CAD        ;UPDATE CAD
3739 076360  000137  077226                    JMP     O.OP2A          ;GO FINISH UP
3740 076364  004537  076416            O.OPAB: JSR     5,2$            ;TEST WORD MODE AND CLOSE
3741 076370  011202                            MOV     @R2,R2          ;GET ABSOLUTE ADDRESS
3742 076372  000770                            BR      1$
3743 076374  004537  076416            O.ORRB: JSR     5,2$            ;TEST AND CLOSE
3744 076400  011201                            MOV     @R2,R1          ;COMPUTE NEW ADDRESS
3745 076402  110101                            MOVB    R1,R1           ;EXTEND THE SIGN
3746 076404  006301                            ASL     R1              ;R2=2(@R2)
3747 076406  005201                            INC     R1              ;   +2
3748 076410  005201                            INC     R1
3749 076412  060102                            ADD     R1,R2           ;   +PC
3750 076414  000757                            BR      1$
3751 076416  004737  101214            2$:     JSR     PC,O.CLSE       ;CLOSE CURRENT CELL
3752 076422  022737  000002  075566            CMP     #2,O.BW         ;ONLY WORD MODE ALLOWED
3753 076430  001003                            BNE     3$              ;BRANCH IF ERROR
3754 076432  013702  075560                    MOV     O.CAD,R2        ;CURRENT ADDRESS IN R2
3755 076436  000205                            RTS     R5
3756 076440  005726                    3$:     TST     (SP)+
3757 076442  000137  076510            O.TCL2: JMP     O.ERR           ;POP A WORD AND SHOW THE ERROR
3758                                            .DSABL  LSB
3759
3760                                    ;       PROCESS S - SINGLE INSTRUCTION MODE
3761 076446  105737  075601            O.SNGL: TSTB    O.SMFD          ;DONT REACT IF ; NOT TYPED
3762 076452  001773                            BEQ     O.TCL2
3763 076454  005702                            TST     R2              ;SEE IF TURN ON OR TURN OFF
3764 076456  001004                            BNE     1$              ;BRANCH IF TURNING IT ON
3765 076460  105037  075571                    CLRB    O.S             ;CLEAR THE FLAG
3766 076464  000137  076520                    JMP     O.DCD           ;CONTINUE THE SCAN
3767 076470  112737  177777  075571    1$:     MOVB    #-1,O.S         ;SET THE FLAG
3768 076476  000137  076520                    JMP     O.DCD
```

```
3771                                    ;
3772                                    ;MINUS PROCESSING
3773                                    ;
3774 076502  105237  075603            O.MIN:  INCB    O.MINS          ;SET MINUS FOUND SWITCH ON
3775 076506  000420                            BR      O.DCD1
3776
3777                                    ; COMMAND DECODER - ODT11X
3778
3779                                    ;  ALL REGISTERS MAY BE USED (R0-R5),
3780
3781 076510  012700  000077            O.ERR:  MOV     #'?,R0          ;  ? TO BE TYPED
3782 076514  004537  100730                    JSR     5,O.FTYP        ; OUTPUT ?
3783 076520  005037  075566            O.DCD:  CLR     O.BW            ;CLOSE ALL
3784 076524  004537  101254                    JSR     5,O.CRLS        ;TYPE  <CR><LF>*
3785 076530  105037  075601            O.DCD3: CLRB    O.SMFD          ;SEMICOLON FOUND FLAG
3786 076534  105037  075600                    CLRB    O.CMFD          ;COMMA FOUND FLAG
3787 076540  105037  075603                    CLRB    O.MINS          ;MINUS SIGN FOUND FLAG
3788 076544  005003                            CLR     R3              ;R3 IS A SAVE REGISTER FOR R2
3789 076546  005005                            CLR     R5              ;R5 IS A SAVE REGISTER FOR R4
3790 076550  005004            O.DCD1: CLR     R4              ; R4 CONTAINS THE CONVERTED OCTAL
3791 076552  005002                            CLR     R2              ; R2 IS THE NUMBER FOUND FLAG
3792 076554  004537  101006            O.SCAN: JSR     5,O.GET         ;GET A CHAR, RETURN IN R0
3793 076560  022700  000060                    CMP     #'0,R0          ;COMPARE WITH ASCII 0
3794 076564  101013                            BHI     5$              ;CHECK LEGALITY IF NON-NUMERIC
3795 076566  022700  000067                    CMP     #'7,R0          ;COMPARE WITH ASCII 7
3796 076572  103410                            BLO     5$              ;CHECK LEGALITY IF NOT OCTAL
3797 076574  042700  177770                    BIC     #177770,R0      ;CONVERT TO BCD
3798 076600  006304                            ASL     R4              ; MAKE ROOM
3799 076602  006304                            ASL     R4              ;  IN
3800 076604  006304                            ASL     R4              ;    R4
3801 076606  060004                            ADD     R0,R4           ;PACK THREE BITS IN R4
3802 076610  005202                            INC     R2              ;R2 HAS NUMERIC FLAG
3803 076612  000760                            BR      O.SCAN          ;   AND TRY AGAIN
3804 076614  005001            5$:     CLR     R1              ;CLEAR INDEX
3805 076616  120061  101321    1$:     CMPB    R0,O.LGCH(R1)   ;DO THE CODES MATCH?
3806 076622  001405                            BEQ     2$              ;JUMP IF YES
3807 076624  005201                            INC     R1              ; SET INDEX FOR NEXT SEARCH
3808 076626  020127  000024                    CMP     R1,#O.CLGT      ;IS THE SEARCH DONE?
3809 076632  103326                            BHIS    O.ERR           ;    OOPS!
3810 076634  000770                            BR      1$              ;RE-LOOP
3811 076636  105737  075603            2$:     TSTB    O.MINS          ;IF MINUS WAS NOT TYPED
3812 076642  001401                            BEQ     4$              ;DO NOT NEGATE K
3813 076644  005404                            NEG     R4              ;OTHERWISE, TAKE 2'S COMPLEMENT.
3814 076646  105737  075600            4$:     TSTB    O.CMFD          ;IF A COMMA NOT TYPED,
3815 076652  001402                            BEQ     3$              ;SKIP NEXT INSTRUCTION.
3816 076654  063704  075604                    ADD     O.BIAS,R4       ;OTHERWISE, ADD RELOC. BIAS TO (R4)
3817 076660  105037  075603            3$:     CLRB    O.MINS          ;REINITIALIZE MINUS-TYPED SWITCH FOR NXT SCAN
3818 076664  006301                            ASL     R1              ;MULTIPLY BY TWO
3819 076666  000171  076672                    JMP     @6$(R1)         ;GO TO PROPER ROUTINE
```

```
3822 076672  076742                6$:     O.SEMI  ;  , SEMICOLON
3823 076674  076760                        O.WRD   ;  /    OPEN WORD
3824 076676  076772                        O.BYT   ;  \    OPEN BYTE -BACK SLASH
3825 076700  077140                        O.CRET  ;  CARRIAGE RETURN    CLOSE
3826 076702  076270                        O.REGT  ;  $  REGISTER OPS
3827 076704  077576                        O.GO    ;  G  GO TO ADDRESS K
3828 076706  077160                        O.OP1   ;  <LF>  MODIFY, CLOSE, OPEN NEXT
3829 076710  076342                        O.ORPC  ;  'BACKARROW''  OPEN RELATED, INDEX - PC (BACK ARROW)
3830 076712  077154                        O.OLD   ;  <  RETURN TO OLD SEQUENCE AND OPEN
3831 076714  077302                        O.BACK  ;  ^  OPEN PREVIOUS (UP ARROW)
3832 076716  077466                        O.OFST  ;  O  OFFSET
3833 076720  077324                        O.BKPT  ;  B  BREAKPOINTS
3834 076722  077732                        O.PROC  ;  P  PROCEED
3835 076724  076364                        O.ORAB  ;  @  OPEN RELATED, ABSOLUTE
3836 076726  076374                        O.ORRB  ;  >  OPEN RELATED, REL. BRANCH
3837 076730  076446                        O.SNGL  ;  S  SINGLE INSTRUCTION MODE
3838 076732  076502                        O.MIN   ;  - MINUS, NEGATES NUMBER TYPED IN
3839 076734  076162                        O.CTLC  ;  ^C EXIT TO MONITOR
3840 076736  076210                        O.CTLF  ;  ^F EXIT TO FIELD SERVICE MODE
3841 076740  076242                        O.CTLE  ;  ^E PROCEED FROM ^D
```

```
3844
3845                                    ; SEMI-COLON PROCESSOR
3846
3847 076742  010203                     0.SEMI: MOV     R2,R3           ;A SEMI-COLON HAS BEEN RECEIVED
3848 076744  010405                             MOV     R4,R5           ;NUMERIC FLAG TO R3, CONTENTS TO R5
3849 076746  105237  075601                     INCB    0.SMFD          ;SET SEMICOLON FOUND FLAG
3850 076752  105037  075600                     CLRB    0.CMFD          ;RESET COMMA FOUND FLAG
3851 076756  000674                             BR      0.DCD1          ;GO BACK FOR MORE
3852
3853                                    ; PROCESS / AND \ - OPEN WORD OR BYTE
3854
3855                                    ;INPUT - IF R2 IS NON-ZERO A NEW RFXP HAS BEEN TYPED IN
3856                                    ;INPUT - -ADDRESS OF WORD TO BE OPENED IS IN R4
3857                                            .ENABL  LSB
3858 076760  012737  000002  075566  0.WRD:  MOV     #2,0.BW         ;OPEN WORD
3859 076766  000404                             BR      11$
3860 076770  006104                     1$:     ROL     R4              ;GET THE ADDRESS BACK
3861 076772  012737  000001  075566  0.BYT:  MOV     #1,0.BW         ;OPEN BYTE
3862 077000  005702                     11$:    TST     R2              ;GET VALUE IF R2 IS NON-ZERO
3863 077002  001011                             BNE     14$             ;BRANCH IF NUMBER INPUT
3864 077004  105737  075600                     TSTB    0.CMFD          ;TEST FOR ','AND';'
3865 077010  001402                             BEQ     12$
3866 077012  000137  076510             13$:    JMP     0.ERR           ;ERROR IF PRESENT WITHOUT NUMBER.
3867 077016  105737  075601             12$:    TSTB    0.SMFD
3868 077022  001373                             BNE     13$
3869 077024  000404                             BR      0.WRD1          ;NO NUMBER - REOPEN PREVIOUS LOCATION
3870 077026  010437  075562             14$:    MOV     R4,0.DOT        ;PUT VALUE IN DOT
3871 077032  010437  075560                     MOV     R4,0.CAD        ;     ALSO IN CAD
3872 077036  022737  000001  075566  0.WRD1: CMP     #1,0.BW         ;CHECK BYTE MODE
3873 077044  001407                             BEQ     22$             ;JUMP IF BYTE
3874 077046  013704  075560                     MOV     0.CAD,R4
3875 077052  006204                             ASR     R4              ;MOVE ONE BIT TO CARRY
3876 077054  103745                             BCS     1$              ;JUMP IF ODD ADDRESS
3877 077056  017700  176476                     MOV     @0.CAD,R0       ;GET CONTENTS OF WORD
3878 077062  000402                             BR      23$
3879 077064  117700  176470             22$:    MOVB    @0.CAD,R0       ;GET CONTENTS OF BYTE
3880 077070  004537  100634             23$:    JSR     5,0.CADV        ;GO GET AND TYPE OUT @CAD
3881 077074  022737  000001  075566             CMP     #1,0.BW         ;CHECK IF BYTE MODE.
3882 077102  001212                             BNE     0.DCD3          ;IF NOT WE'RE DONE. ELSE:
3883 077104  112700  000075                     MOVB    #'=,R0          ;TYP ''='' AND THEN THE ASCII BYTE
3884 077110  004537  100730                     JSR     5,0.FTYP
3885 077114  117700  176440                     MOVB    @0.CAD,R0
3886 077120  004537  100730                     JSR     5,0.FTYP
3887 077124  112700  000040                     MOVB    #' ,R0
3888 077130  004537  100730                     JSR     5,0.FTYP
3889 077134  000137  076530                     JMP     0.DCD3          ;GO BACK TO DECODER
3890                                            .DSABL  LSB
```

```
3893                                    ; PROCESS CARRIAGE RETURN
3894 077140  004737  101214            O.CRET: JSR     PC,O.CLSE       ;CLOSE LOCATION
3895 077144  000137  076520            O.DCDA: JMP     O.DCD           ;RETURN TO DECODER
3896
3897 077150  000137  076510            O.ERR3: JMP     O.ERR           ; INTERMEDIATE HELP
3898
3899                                    ; PROCESS <LF>, OPEN NEXT WORD
3900
3901 077154  105237  075570            O.OLD:  INCB    O.SEQ           ;SET FLAG TO LATER RESTORE CAD
3902 077160  005737  075566            O.OP1:  TST     O.BW            ;<LF> RECEIVED
3903 077164  001771                    O.ERR2: BEQ     O.ERR3          ;ERROR IF NOTHING IS OPEN
3904 077166  004737  101214                    JSR     PC,O.CLSE       ;CLOSE PRESENT CELL
3905 077172  105737  075570                    TSTB    O.SEQ           ;SHOULD CAD BE RESTORED?
3906 077176  001405                          BEQ     1$              ;BRANCH IF NOT
3907 077200  013737  075562  075560          MOV     O.DOT,O.CAD     ;RESTORE PREVIOUS SEQUENCE
3908 077206  105037  075570                  CLRB    O.SEQ           ;RESET FLAG; NO LONGER NEEDED
3909 077212  063737  075566  075560  1$:     ADD     O.BW,O.CAD      ;GENERATE NEW ADDRESS
3910 077220  013737  075560  075562  O.OP2:  MOV     O.CAD,O.DOT     ;INITIALIZE DOT
3911 077226  004537  101246          O.OP2A: JSR     5,O.CRLF        ;<CR><LF>
3912 077232  013746  075566                  MOV     O.BW,-(SP)      ;SAVE BW
3913 077236  012737  000002  075566          MOV     #2,O.BW         ;SET TO TYPE FULL WORD ADDRESS
3914 077244  013700  075560                  MOV     O.CAD,R0        ;NUMBER TO TYPE
3915 077250  004537  101272                  JSR     5,O.RORA        ; CHECK FORMAT
3916 077254  011637  075566                  MOV     @SP,O.BW        ;RESTORE BW
3917 077260  012700  027534                  MOV     #27534,R0       ;PUT "/\" IN R0
3918 077264  022726  000001                  CMP     #1,(SP)+        ;IS IT BYTE MODE?
3919 077270  001401                          BEQ     1$              ;JUMP IF YES
3920 077272  000300                          SWAB    R0              ;TYPE A /
3921 077274  004537  100730          1$:     JSR     5,O.FTYP        ;TYPE THE LOW BYTE OF R0
3922 077300  000656                          BR      O.WRD1          ;GO PROCESS IT
3923
```

```
3926
3927                                    ; PROCESS ^, OPEN PREVIOUS WORD
3928
3929 077302  005737  075566            O.BACK: TST     O.BW            ;  ^ RECEIVED
3930 077306  001726                            BEQ     O.ERR2          ;ERROR IF NOTHING OPEN
3931 077310  004737  101214                    JSR     PC,O.CLSE
3932 077314  163737  075566  075560            SUB     O.BW,O.CAD      ;GENERATE NEW ADDRESS
3933 077322  000736                            BR      O.OP2           ;GO DO THE REST
3934
3935                                    ; B HANDLER - SET AND REMOVE BREAKPOINTS
3936
3937 077324  012700  101370            O.BKPT: MOV     #O.TRTC,R0
3938 077330  006304                            ASL     R4              ;MULTIPLY NUMBER BY TWO
3939 077332  005703                            TST     R3
3940 077334  001423                            BEQ     3$              ;IF R3 IS ZERO GO REMOVE BREAKPOINT
3941 077336  006205                            ASR     R5              ;GET ONE BIT TO CARRY
3942 077340  103514                            BCS     O.ERR1          ;BADNESS IF ODD ADDRESS
3943 077342  006305                            ASL     R5              ;RESTORE ONE BIT
3944 077344  062704  075706                    ADD     #O.ADR1,R4
3945 077350  005702                            TST     R2
3946 077352  001007                            BNE     1$              ;JUMP IF SPECIFIC CELL
3947 077354  020014                    2$:     CMP     R0,@R4          ;IS THIS CELL FREE?
3948 077356  001405                            BEQ     1$              ;JUMP IF YES
3949 077360  020427  075724                    CMP     R4,#O.BKP+O.ADR1;ARE WE AT THE END OF OUR ROPE
3950 077364  103102                            BHIS    O.ERR1          ;YES, THERE IS NOTHING FREE
3951 077366  005724                            TST     (R4)+           ;INCREMENT BY TWO
3952 077370  000771                            BR      2$
3953 077372  020427  075724            1$:     CMP     R4,#O.BKP+O.ADR1
3954 077376  101075                            BHI     O.ERR1          ;ERROR IF TOO LARGE
3955 077400  010514                            MOV     R5,@R4          ;SET BREAKPOINT
3956 077402  000660                            BR      O.DCDA          ;RETURN
3957 077404  005702                    3$:     TST     R2
3958 077406  001410                            BEQ     O.RALL          ;GO REMOVE ALL
3959 077410  020427  000016                    CMP     R4,#O.BKP
3960 077414  101066                            BHI     O.ERR1          ;JUMP IF NUMBER TOO LARGE
3961 077416  010064  075706                    MOV     R0,O.ADR1(R4)   ;CLEAR BREAKPOINT
3962 077422  005064  075730                    CLR     O.CT(R4)        ;CLEAR COUNT ALSO
3963 077426  000646                            BR      O.DCDA
3964 077430  005004                    O.RALL: CLR     R4
3965 077432  012700  101370                    MOV     #O.TRTC,R0
3966 077436  020427  000020            1$:     CMP     R4,#O.BKP+2     ;ALL DONE?
3967 077442  101240                            BHI     O.DCDA          ;JUMP IF YES
3968 077444  010064  075706                    MOV     R0,O.ADR1(R4)   ;RESET BKPT
3969 077450  012764  000003  075752            MOV     #TRT,O.UIN(R4)  ;RESET CONTENTS OF TABLE
3970 077456  005064  075730                    CLR     O.CT(R4)        ;CLEAR COUNT
3971 077462  005724                            TST     (R4)+           ;INCREMENT BY TWO
3972 077464  000764                            BR      1$
3973
```

```
3976
3977                                    ; PROCESS O, COMPUTE OFFSET
3978
3979 077466  022737  000002  075566  O.OFST: CMP     #2,O.BW         ;CHECK WORD MODE
3980 077474  001036                          BNE     O.ERR1          ;ERROR IF NOT CORRECT MODE
3981 077476  012700  000040                  MOV     #' ,R0          ;TYPE ONE BLANK
3982 077502  004537  100730                  JSR     5,O.FTYP        ;  AS A SEPARATOR
3983 077506  005703                          TST     R3              ;WAS SEMI-COLON TYPED?
3984 077510  001430                          BEQ     O.ERR1          ;NO, CALL IT AN ERROR
3985 077512  163705  075560                  SUB     O.CAD,R5        ;COMPUTE
3986 077516  005305                          DEC     R5
3987 077520  005305                          DEC     R5              ;     16 BIT OFFSET
3988 077522  010500                          MOV     R5,R0
3989 077524  004537  100634                  JSR     5,O.CADV        ;NUMBER IN R0 - WORD MODE
3990 077530  010500                          MOV     R5,R0
3991 077532  006200                          ASR     R0              ;DIVIDE BY TWO
3992 077534  103414                          BCS     1$              ;ERROR IF ODD
3993 077536  022700  177600                  CMP     #-200,R0        ;COMPARE WITH -200
3994 077542  003011                          BGT     1$              ;DO NOT TYPE IF OUT OF RANGE
3995 077544  022700  000177                  CMP     #177,R0         ;COMPARE WITH +177
3996 077550  002406                          BLT     1$              ;DO NOT TYPE IF OUT OF RANGE
3997 077552  005337  075566                  DEC     O.BW            ;SET TEMPORARY BYTE MODE
3998 077556  004537  100634                  JSR     5,O.CADV        ;NUMBER IN R0 - BYTE MODE
3999 077562  005237  075566                  INC     O.BW            ;RESTORE WORD MODE
4000 077566  000137  076530          1$:     JMP     O.DCD3          ;ALL DONE
4001
4002 077572  000137  076510          O.ERR1: JMP     O.ERR           ;INTERMEDIATE HELP
```

```
4005                                    ; PROCESS G - GO
4006
4007 077576  105737  075601        O.GO:   TSTB    O.SMFD          ;WAS ";" TYPED?
4008 077602  001773                        BEQ     O.ERR1          ;BR IF NOT TYPED
4009 077604  005703                        TST     R3              ;WAS K; TYPED?
4010 077606  001771                        BEQ     O.ERR1          ; TYPE ?<CR,LF> IF NOT
4011 077610  112737  000021  075573        MOVB    #O.BKP+3,O.P    ;CLEAR PROCEED
4012 077616  006205                        ASR     R5              ;CHECK LOW ORDER BIT
4013 077620  103764                        BCS     O.ERR1          ;ERROR IF ODD NUMBER
4014 077622  006305                        ASL     R5              ;RESTORE WORD
4015 077624  010537  075700        O.GOGO: MOV     R5,O.UPC        ;SET UP NEW PC
4016 077630  012746  000340                MOV     #O.STM,-(SP)    ;SET HIGH PRIORITY
4017 077634  004737  101202                JSR     PC,O.WST
4018 077640  004537  100534                JSR     5,O.RSTT        ;RESTORE TELETYPE
4019 077644  105037  075572        O.TBIT: CLRB    O.T             ;CLEAR
4020 077650  052737  000020  075702        BIS     #O.TBT,O.UST    ;    BOTH T-BIT FLAGS
4021 077656  105737  075571                TSTB    O.S             ;SEE IF WE NEED A T BIT
4022 077662  001005                        BNE     O.GO2           ;IF NOT GO NOW
4023 077664  042737  000020  075702        BIC     #O.TBT,O.UST    ;CLEAR THE T BIT
4024 077672  004537  100450                JSR     5,O.RSB         ;RESTORE BREAKPOINTS
4025 077676  004037  100416        O.GO2:  JSR     0,O.RSR         ;RESTORE REGISTERS
4026 077702  013746  075702                MOV     O.UST,-(SP)     ;    AND STATUS
4027 077706  013746  075700                MOV     O.UPC,-(SP)     ;    AND PC
4028 077712  000240                        NOP                     ; CHANGE TO HALT FOR DEBUGGING
4029 077714  013746  075702                MOV     O.UST,-(SP)     ; MOV IN STATUS FIRST W/O T BIT
4030 077720  042716  177420                BIC     #O.TBT.177400,(SP); SO INTERRUPTS CAN HAPPEN BEFORE
4031 077724  004737  101202                JSR     PC,O.WST        ;  RTT TURNS ON THE T BIT.
4032 077730  000006                        RTT
```

```
4035                                    ; PROCESS P - PROCEED
4036                                    ;   ONLY ALLOWED AFTER A BREAKPOINT
4037
4038 077732  105737  075601             O.PROC: TSTB    O.SMFD          ;WAS ";" TYPED?
4039 077736  001715                             BEQ     O.ERR1          ;BR IF NOT TYPED
4040 077740  113700  075573                     MOVB    O.P,R0
4041 077744  105700                             TSTB    R0              ;CHECK LEGALITY OF PROCEED
4042 077746  002711                             BLT     O.ERR1          ;NOT LEGAL
4043 077750  005702                             TST     R2              ;CHECK FOR ILLEGAL COUNT
4044 077752  001307                             BNE     O.ERR1          ;JUMP IF ILLEGAL
4045 077754  005703                             TST     R3              ;WAS COUNT SPECIFIED?
4046 077756  001402                             BEQ     O.PR1           ;NO
4047 077760  010560  075730                     MOV     R5,O.CT(R0)     ;YES, PUT AWAY COUNT
4048 077764  012746  000340             O.PR1:  MOV     #O.STM,-(SP)    ;FORCE HIGH PRIORITY
4049 077770  004737  101202                     JSR     PC,O.WST
4050 077774  004537  100534                     JSR     5,O.RSTT        ;RESTORE TTY
4051 100000  123727  075573  000016     O.C1:   CMPB    O.P,#O.BKP      ;SEE IF A REAL ONE OR A FAKE
4052 100006  003316                             BGT     O.TBIT          ;BRANCH IF FAKE
4053 100010  105737  075571                     TSTB    O.S             ;SEE IF SINGLE INSTRUCTION MODE
4054 100014  001313                             BNE     O.TBIT          ;IF SO EXIT NOW
4055 100016  012746  000340                     MOV     #O.STM,-(SP)    ;SET HIGH PRIORITY
4056 100022  004737  101202                     JSR     PC,O.WST
4057 100026  105237  075572                     INCB    O.T             ;SET T-BIT FLAG
4058 100032  052737  000020  075702             BIS     #O.TBT,O.UST    ;SET T-BIT
4059 100040  000716                             BR      O.GO2
```

```
4062                                        ; BREAKPOINT HANDLER
4063 100042  012637  075700          0.BRK: MOV     (SP)+,0.UPC      ;PRIORITY IS 7 UPON ENTRY
4064 100046  012637  075702                 MOV     (SP)+,0.UST      ;SAVE STATUS AND PC
4065 100052  112737  000021  075573         MOVB    #0.BKP+3,0.P     ;TELL ;P THAT WE CAN CONTINUE
4066 100060  004037  100360          0.BK1: JSR     0,0.SVR          ;SAVE VARIOUS REGISTERS
4067 100064  105737  075572                 TSTB    0.T              ;CHECK FOR T-BIT SET
4068 100070  001265                        BNE     0.TBIT           ;JUMP IF SET
4069 100072  004537  100602                 JSR     5,0.REM          ;REMOVE BREAKPOINTS
4070 100076  105737  075704                 TSTB    0.PRI            ;CHECK IF PRIORITY
4071 100102  100003                        BPL     2$               ; IS AS SAME AS USER PGM
4072 100104  113705  075702                 MOVB    0.UST,R5         ;PICK UP USER UST IF SO
4073 100110  000407                        BR      3$
4074 100112  113705  075704          2$:    MOVB    0.PRI,R5         ;OTHERWISE PICK UP ACTUAL PRIORITY
4075 100116  000257                        CCC                      ;CLEAR CARRY
4076 100120  106005                        RORB    R5               ;SHIFT LOW ORDER BITS
4077 100122  106005                        RORB    R5               ;  INTO
4078 100124  106005                        RORB    R5               ;    HIGH ORDER
4079 100126  106005                        RORB    R5               ;      POSITION
4080 100130  042705  177420          3$:    BIC     #0.TBT!177400,R5;CLEAR POSSIBLE T BIT (S/I MODE)
4081 100134  010546                        MOV     R5,-(SP)         ;PUT THE STATUS AWAY WHERE IT BELONGS
4082 100136  004737  101202                 JSR     PC,0.WST
4083 100142  013705  075700                 MOV     0.UPC,R5         ;GET PC, IT POINTS TO THE TRT
4084 100146  105737  075571                 TSTB    0.S              ;SEE IF IT WAS SINGLE INSTRUCTION FUN
4085 100152  100432                        BMI     14$              ;IF SO HANDLE THERE
4086 100154  005745                        TST     -(R5)
4087 100156  010537  075700                 MOV     R5,0.UPC
4088 100162  012704  000016                 MOV     #0.BKP,R4        ;GET A COUNTER
4089 100166  020564  075706          11$:   CMP     R5,0.ADR1(R4)    ;COMPARE WITH LIST
4090 100172  001426                        BEQ     12$              ;JUMP IF FOUND
4091 100174  005304                        DEC     R4
4092 100176  005304                        DEC     R4
4093 100200  002372                        BGE     11$              ;RE-LOOP UNTIL FOUND
4094 100202  004537  100500                 JSR     5,0.SVTT         ;SAVE TELETYPE STATUS
4095 100206  004537  101246                 JSR     5,0.CRLF
4096 100212  012704  101366                 MOV     #0.BD,R4         ;ERROR, NOTHING FOUND
4097 100216  012703  101367                 MOV     #0.BD+1,R3
4098 100222  004537  101126                 JSR     5,0.TYPE         ;OUTPUT 'BE'' FOR BAD ENTRY
4099 100226  010500                        MOV     R5,R0
4100 100230  062737  000002  075700         ADD     #2,0.UPC         ;POP OVER THE ADJUSTMENT ABOVE
4101 100236  000444                        BR      13$              ; OR CONTINUE
```

```
4104 100240 112704 000020          14$:  MOVB   #O.BKP+2,R4      ;SET BREAK POINT HIGH + 1
4105 100244 010564 075706                MOV    R5,O.ADR1(R4)    ;STORE NEXT PC VALUE FOR TYPE OUT
4106 100250 110437 075575          12$:  MOVB   R4,O.P           ;ALLOW PROCEED
4107 100254 005364 075730                DEC    O.CT(R4)
4108 100260 003247                       BGT    O.C1             ;JUMP IF REPEAT
4109 100262 012764 000001 075730         MOV    #1,O.CT(R4)      ;RESET COUNT TO 1
4110 100270 004537 100500                JSR    5,O.SVTT         ;SAVE TELETYPE STATUS, R4 IS SAFE
4111 100274 012700 000102                MOV    #'B,R0
4112 100300 004537 100730                JSR    5,O.FTYP         ;TYPE 'B'
4113 100304 113700 075573                MOVB   O.P,R0           ;CONVERT BREAKPOINT NUMBER TO ASCII
4114 100310 062700 000140                ADD    #140,R0
4115 100314 006200                       ASR    R0
4116 100316 004537 100730                JSR    5,O.FTYP
4117 100322 012700 000073                MOV    #';,R0
4118 100326 004537 100730                JSR    5,O.FTYP         ; TYPE
4119 100332 012737 000002 075566         MOV    #2,O.BW          ; SET WORD MODE
4120 100340 113704 075573                MOVB   O.P,R4
4121 100344 016400 075706                MOV    O.ADR1(R4),R0    ;GET ADDRESS OF BREAK
4122 100350 004537 101272          13$:  JSR    5,O.RORA         ; CHECK FORMAT
4123 100354 000137 076520                JMP    O.DCD            ;GO TO DECODER
```

```
                                        ; SAVE REGISTERS R0-R6
                                        ;   INTERNAL STACK
                                        ;
100360 012637 075564            O.SVR:  MOV     (SP)+,O.XXX     ;PICK REGISTER FROM STACK AND SAVE
100364 010637 075676                    MOV     SP,O.USP        ;SAVE USER STACK ADDRESS
100370 012706 075676                    MOV     #O.USP,SP       ;SET TO INTERNAL STACK
100374 010546                           MOV     R5,-(SP)        ;SAVE
100376 010446                           MOV     R4,-(SP)        ; REGISTERS
100400 010346                           MOV     R3,-(SP)        ;1
100402 010246                           MOV     R2,-(SP)        ; THRU
100404 010146                           MOV     R1,-(SP)        ;    5
100406 013746 075564                    MOV     O.XXX,-(SP)     ;PUT SAVED REGISTER ON STACK
100412 005746                           TST     -(SP)
100414 000200                           RTS     R0
                                        ;
                                        ; RESTORE REGISTERS R0-R6
                                        ;
100416 005726                   O.RSR:  TST     (SP)+           ;POP THE EXTRA CELL
100420 012637 075564                    MOV     (SP)+,O.XXX     ;GET R0 FROM STACK
100424 012601                           MOV     (SP)+,R1        ;RESTORE
100426 012602                           MOV     (SP)+,R2        ; REGISTERS
100430 012603                           MOV     (SP)+,R3        ;  1
100432 012604                           MOV     (SP)+,R4        ;  THRU
100434 012605                           MOV     (SP)+,R5        ;    5
100436 013706 075676                    MOV     O.USP,SP        ;RESTORE USER STACK
100442 013746 075564                    MOV     O.XXX,-(SP)     ;PUT R0 ON USER STACK
100446 000200                           RTS     R0
```

```
4155                                    ; RESTORE BREAKPOINTS 0-7
4156
4157 100450  012704  000016            O.RSB:  MOV     #O.BKP,R4       ;RESTORE ALL BREAKPOINTS
4158 100454  017464  075706  075752      1$:    MOV     @O.ADR1(R4),O.UIN(R4);SAVE CONTENTS
4159 100462  013774  101370  075706             MOV     O.TRTC,@O.ADR1(R4);REPLACE WITH TRAP
4160 100470  005304                             DEC     R4
4161 100472  005304                             DEC     R4
4162 100474  002367                             BGE     1$              ;RE-LOOP UNTIL DONE
4163 100476  000205                             RTS     R5              ;  THEN QUIT
4164
4165                                    ; SAVE TELETYPE STATUS
4166
4167 100500  113737  177560  075574    O.SVTT: MOVB    O.RCSR,O.CSR1   ;SAVE R C/SR
4168 100506  113737  177564  075575            MOVB    O.TCSR,O.CSR2   ;SAVE T C/SR
4169 100514  105037  177560                    CLRB    O.RCSR          ;CLEAR ENABLE AND MAINTENANCE
4170 100520  105037  177564                    CLRB    O.TCSR          ;  BITS IN BOTH C/SR
4171 100524  105737  177564            1$:     TSTB    O.TCSR          ;LOOP UNTIL READY BIT COMES ON
4172 100530  100375                            BPL     1$              ;BR IF BIT NOT ON
4173 100532  000205                            RTS     R5
4174                                    ; RESTORE TELETYPE STATUS
4175
4176 100534  004537  101246            O.RSTT: JSR     5,O.CRLF
4177 100540  105737  177564                    TSTB    O.TCSR          ;WAIT READY
4178 100544  100375                            BPL     .-4             ;  ON PRINTER
4179 100546  032737  004000  177560            BIT     #4000,O.RCSR    ;CHECK BUSY FLAG
4180 100554  001403                            BEQ     1$              ;SKIP READY LOOP IF NOT BUSY
4181 100556  105737  177560                    TSTB    O.RCSR          ;WAIT READY
4182 100562  100375                            BPL     .-4             ;    ON READER
4183 100564  113737  075574  177560    1$:     MOVB    O.CSR1,O.RCSR   ;RESTORE
4184 100572  113737  075575  177564            MOVB    O.CSR2,O.TCSR   ;  THE STATUS REGISTERS
4185 100600  000205                            RTS     R5
4186
4187                                    ; REMOVE BREAKPOINTS 0-7
4188                                    ;   IN THE OPPOSITE ORDER OF SETTING
4189
4190 100602  105737  075571            O.REM:  TSTB    O.S             ;SEE IF SINGLE INSTRUCTION IS GOING
4191 100606  001011                            BNE     2$              ;EXIT IF SO
4192 100610  005004                            CLR     R4              ;REMOVE ALL BREAKPOINTS
4193 100612  016474  075752  075706    1$:     MOV     O.UIN(R4),@O.ADR1(R4)   ;CLEAR BREAKPOINT
4194 100620  005204                            INC     R4
4195 100622  005204                            INC     R4
4196 100624  020427  000016                    CMP     R4,#O.BKP
4197 100630  003770                            BLE     1$              ;RE-LOOP UNTIL DONE
4198 100632  000205                    2$:     RTS     R5              ;THEN QUIT
```

```
4201                                    ; TYPE OUT CONTENTS OF WORD OR BYTE WITH ONE TRAILING SPACE
4202                                    ; WORD IS IN R0
4203
4204 100634  012703  000006            0.CADV: MOV     #6,R3           ;# OF DIGITS
4205 100640  012704  177776                    MOV     #-2,R4          ;# OF BITS FIRST-3
4206 100644  022737  000001  075566            CMP     #1,0.BW         ;SEE IF WORD MODE
4207 100652  001004                            BNE     3$              ;BRANCH IF SO
4208 100654  162703  000003                    SUB     #3,R3           ;ONLY DO 3 DIGITS
4209 100660  005204                            INC     R4              ;DO 2 BITS FIRST
4210 100662  000300                            SWAB    R0              ;AND TURN R0 AROUND
4211 100664  010046                    3$:     MOV     R0,-(SP)        ;SAVE R0
4212 100666  062704  000003            2$:     ADD     #3,R4           ;COMPUTE THE NUMBER OF BITS TO DO
4213 100672  005000                            CLR     R0
4214 100674  006116                    1$:     ROL     (SP)            ;GET A BIT
4215 100676  006100                            ROL     R0              ;STORE IT AWAY
4216 100700  005304                            DEC     R4              ;DECREMENT COUNTER
4217 100702  003374                            BGT     1$              ;LOOP IF MORE BITS NEEDED
4218 100704  062700  000060                    ADD     #'0,R0          ;CONVERT TO ASCII
4219 100710  004537  100730                    JSR     R5,0.FTYP       ;TYPE IT
4220 100714  005303                            DEC     R3              ;SEE IF MORE DIGITS TO DO
4221 100716  003363                            BGT     2$              ;LOOP IF SO
4222 100720  112700  000040                    MOVB    #' ,R0          ;SET UP FOR TRAILING SPACE
4223 100724  005726                            TST     (SP)+           ;GET RID OF JUNK
4224 100726  000400                            BR      0.FTYP
4225
4226
4227                                    ; TYPE ONLY ONE CHARACTER (CONTAINED IN R0)
4228
4229 100730  105737  177564            0.FTYP: TSTB    0.TCSR
4230 100734  100375                            BPL     0.FTYP
4231 100736  042700  177400                    BIC     #177400,R0      ;CLEAR HIGH BYTE,SHOULD NOT
4232                                                                    ;CONTAIN INPORTANT INFO.
4233 100742  001416                            BEQ     3$
4234 100744  022700  000176                    CMP     #176,R0         ;PRINT ? FOR 177;16-37
4235 100750  103411                            BLO     2$              ; 1-10 AND 200-377.
4236 100752  022700  000037                    CMP     #37,R0
4237 100756  103410                            BLO     3$
4238 100760  022700  000015                    CMP     #15,R0
4239 100764  103403                            BLO     2$
4240 100766  022700  000010                    CMP     #10,R0
4241 100772  103402                            BLO     3$
4242 100774  012700  000077            2$:     MOV     #'?,R0
4243 101000  110037  177566            3$:     MOVB    R0,0.TDB
4244 101004  000205                    0.TYP1: RTS     R5
```

```
4247                                    ; GENERAL CHARACTER INPUT ROUTINE -- OD'11X
4248                                    ; CHARACTER INPUT GOES TO R0
4249
4250 101006  105737  177560    O.GET:   TSTB    O.RCSR          ;WAIT FOR
4251 101012  100375                     BPL     O.GET           ;  INPUT FROM KBD
4252 101014  113700  177562             MOVB    O.RDB,R0        ;GET CHARACTER - STRIP OFF PARITY
4253 101020  042700  177600             BIC     #177600,R0      ;STRIP OFF PARITY FROM CHARACTER
4254 101024  122700  000003             CMPB    #3,R0           ;IS IT ^C?
4255 101030  001435                     BEQ     3$              ;IF SO, DO NOT ECHO
4256 101032  122700  000006             CMPB    #6,R0           ;IS IT ^F?
4257 101036  001432                     BEQ     3$              ;IF SO, DO NOT ECHO
4258 101040  122700  000005             CMPB    #5,R0           ;IS IT ^E?
4259 101044  001427                     BEQ     3$              ;IF SO, DO NOT ECHO
4260 101046  105737  075602             TSTB    O.SCRN          ;SHOULD WE ECHO <LF>?
4261 101052  001003                     BNE     2$              ;BR IF YES
4262 101054  120027  000012             CMPB    R0,#012         ;SEE IF A <LF>
4263 101060  001421                     BEQ     3$              ;IF SO SAVE THE PAPER
4264 101062  120027  000173    2$:      CMPB    R0,#173
4265 101066  002005                     BGE     1$
4266 101070  122700  000140             CMPB    #140,R0         ;TEST FOR LOWER CASE
4267 101074  002002                     BGE      1$
4268 101076  162700  000040             SUB     #40,R0          ;CHAR IS LC-CONVERT TO UPPER CASE
4269 101102  004537  100730    1$:      JSR     5,O.FTYP        ;ECHO CHARACTER
4270 101106  001737                     BEQ     O.GET           ;IGNORE NULLS
4271 101110  105737  075602             TSTB    O.SCRN          ;SHOULD WE PASS ON SPACES?
4272 101114  001003                     BNE     3$              ;BR IF YES
4273 101116  122700  000040             CMPB    #40,R0          ;CHECK FOR SPACES
4274 101122  001731                     BEQ     O.GET           ;IGNORE SPACES
4275 101124  000205    3$:      RTS     R5
```

```
                                        ; GENERAL CHARACTER OUTPUT ROUTINE - ODT11X
                                        ;  ADDRESS OF FIRST BYTE IN R4,
                                        ;  ADDRESS OF LAST BYTE IN R3, (R3)>(R4)
                                        ; EXPECTS LOCS 56,57 TO BE INITIALIZED BY MONITOR FOR FILL
                                        ; CHARACTERISTICS OF TERMINAL
                                        ;  56=CHAR TO BE FILLED AFTER
                                        ;  57=# OF NULLS TO FILL WITH

101126  020304                  O.TYPE: CMP     R3,R4           ;CHECK FOR COMPLETION
101130  103725                          BLO     O.TYP1          ; EXIT WHEN DONE
101132  112400                          MOVB    (R4)+,R0        ;GET A CHARACTER
101134  004537  100730                  JSR     5,O.FTYP        ;TYPE ONE CHARACTER
101140  120037  003002                  CMPB    R0,@#$FILLC     ;COMPARE CHAR AGAINST FILL REQUIREMENT
101144  001370                          BNE     O.TYPE          ;NO FILL NEEDED
101146  113737  002451  075576          MOVB    @#$FILLS,O.FIL  ;FILL COUNT INTO TEMP
101154  005000                          CLR     R0              ;FILL WITH NULLS
101156  004537  100730          2$:     JSR     R5,O.FTYP       ;TYPE NULLS
101162  105337  075576                  DECB    O.FIL           ;DECREASE COUNT
101166  003373                          BGT     2$              ;BRANCH IF NOT DONE
101170  000756                          BR      O.TYPE          ;LOOP UNTIL DONE
```

```
                                        ;SUBROUTINE TO READ THE PS INDEPENDENT OF MACHINE
                                        ;
101172  013737  177776  075702  O.RRST: MOV     ST,O.UST        ;STORE THE STATUS IN USER
                                                                ;STATUS AREA.FOR AN LSI
                                                                ;THIS IS CHANGED TO
                                                                ;MFPS O.UST
101200  000207                         RTS     PC
                                        ;
                                        ;SUBROUTINE TO WRITE PS INDEPENDENT OF MACHINE
                                        ;CALL ROUTINE WITH PS VALUE
                                        ;ON THE STACK
                                        ;
101202  016637  000002  177776  O.WS*:  MOV     2(SP),ST        ;STORE NEW PS VALUE
                                                                ;THIS INSTRUCTION IS CHANGED FOR LSI
                                                                ;TO MTPS 2(SP)
101210  012616                         MOV     (SP)+,(SP)      ;PUT RETURN PC OVER SUB. ARGUMENT
101212  000207                         RTS     PC              ;TO RETURN WITHOUT IT ON THE STACK
                                        ; CLOSE WORD OR BYTE AND EXIT,
                                        ; UPON ENTERING, R2 HAS NUMERIC FLAG, R4 HAS CONTENTS
                                        ;
                                        .ENABL  LSB
101214  005702                 O.CLSE: TST     R2              ;IF NO NUMBER WAS TYPED THERE IS
101216  001412                         BEQ     1$              ;NO CHANGE TO THE OPEN CELL
101220  022737  000001  075566         CMP     #1,O.BW
101226  001404                         BEQ     2$              ;JUMP IF BYTE MODE
101230  101005                         BHI     1$              ;JUMP IF ALREADY CLOSED
101232  010477  174322                 MOV     R4,@O.CAD       ;STORE WORD
101236  000402                         BR      1$
101240  110477  174314         2$:     MOVB    R4,@O.CAD       ;STORE BYTE
101244  000207                 1$:     RTS     PC
101246  012703  101317         O.CRLF: MOV     #O.CR+1,R3      ;LWA <CR,LF>
101252  000402                         BR      3$
101254  012703  101320         O.CRLS: MOV     #O.CR+2,R3      ;LWA <CR,LF>*
101260  012704  101316         3$:     MOV     #O.CR,R4        ;FWA
101264  004537  101126                 JSR     5,O.TYPE        ;TYPE SOMETHING
101270  000205                         RTS     R5
                                        .DSABL  LSB
```

```
                                        ;SUBROUTINE O.RORA
                                        ;FUNCTION:                              THE
                                        ;ADDRESS WILL BE PRINTED IN ABSOLUTE FORM
                                        ;INPUT: THE ADDRESS TO BE PRINTED IS IN R0.
                                        ;DATA SAVED:  R0 CONTAINING THE ADDRESS TO BE
                                        ;PRINTED, AND LOCATION O.CAD CONTAINING
                                        ;THE CURRENT ADDRESS WERE SAVED AND RESTORED.
                                        ;CALLED:  JSR 5,O.RORA

101272  004537  100634          O.RORA: JSR     5,O.CADV        ;PRINT ABSOLUTE ADDRESS
101276  000205                          RTS     R5
101300     012                  O.ID:   .BYTE   012
101301     015                          .BYTE   015
101302     040                          .BYTE   40
101303     117      104      124        .ASCII /ODT (CEMKA)/
101306     040      050      103
101311     105      115      113
101314     101      051
        101315                  O.IDND-.-1
101316     015                  O.CR:   .BYTE   015     ;  <CR>
101317     012                          .BYTE   012     ;  <LF>
101320     052                          .BYTE   '*      ;  *

101321     073                  O.LGCH: .BYTE   ';      ;
101322     057                          .BYTE   '/      ;  /
101323     134                          .BYTE   '\      ;  \      (BACK SLASH)
101324     015                          .BYTE   015     ;  CARRIAGE RETURN
101325     044                          .BYTE   '$      ;  $
101326     107                          .BYTE   'G      ;  G
101327     012                          .BYTE   012     ;  <LF>
101330     137                          .BYTE   '_      ;  _      (BACK ARROW)
101331     074                          .BYTE   '<      ;  <
101332     136                          .BYTE   '^      ;  ^      (UP ARROW)
101333     117                          .BYTE   'O      ;  O
101334     102                          .BYTE   'B      ;  B
101335     120                          .BYTE   'P      ;  P
101336     100                          .BYTE   '@      ;  @
101337     076                          .BYTE   '>      ;  >
101340     123                          .BYTE   'S      ;  S
101341     055                          .BYTE   '-      ;  -
101342     003                          .BYTE   003     ;CTRL C
101343     006                          .BYTE   006     ;CTRL F
101344     005                          .BYTE   005     ;CTRL E
        000024                  O.CLGT          .-O.LGCH                ;TABLE LENGTH

101345     123                  O.TL:   .BYTE   'S      ;DO        1
101346     120                          .BYTE   'P      ;NOT       2
101347     115                          .BYTE   'M      ;CHANGE    3
101350     000                          .BYTE   0       ;THE       4
101351     000                          .BYTE   0       ;ORDER     5
101352     103                          .BYTE   'C      ;          6
101353     106                          .BYTE   'F      ;          7
101354     122                          .BYTE   'R      ;         10
101355     000                          .BYTE   0       ;         11
101356     000                          .BYTE   0       ;         12
101357     000                          .BYTE   0       ;         13
101360     000                          .BYTE   0       ;         14
```

```
 4393 101361 000                        .BYTE   0       ;       15
 4394 101362 000                        .BYTE   0       ;       16
 4395 101363 000                        .BYTE   0       ;       17
 4396 101364 102                        .BYTE   'B      ;       20
 4397        000020              O.LG    =       .-O.TL
 4398                                    .EVEN
 4399 101366 042502              O.BD:   .WORD   'BE
 4400 101370 000003              O.TRTC: TRT                     ;TRACE TRAP PROTOTYPE
```

```
                                        .SBTTL  TABLE   ERROR POINTER

                                ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                                ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS (ERRPC).
                                ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:

                                ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                ;*      DH              ;;POINTS TO THE DATA HEADER
                                ;*      DT              ;;POINTS TO THE DATA
                                ;*      DF              ;;POINTS TO THE DATA FORMAT


101372                          $ERRTB: ;ERROR  1
101372  104530                          EM24
101374  110307                          DH13
101376  102504                          DT13
101400  103103                          DF11
                                        ;ERROR  2
101402  103220                          EM2
101404  107366                          DH1
101406  102252                          DT1
101410  102743                          DF2
                                        ;ERROR  3
101412  103256                          EM3
101414  107446                          DH3
101416  102302                          DT3
101420  103071                          DF9
                                        ;ERROR  4
101422  103311                          EM4
101424  107446                          DH3
101426  102312                          DT4
101430  103071                          DF9
                                        ;ERROR  5
101432  103357                          EM5
101434  107507                          DH5
101436  102322                          DT5
101440  102743                          DF2
                                        ;ERROR  6
101442  103434                          EM6
101444  107507                          DH5
101446  102322                          DT5
101450  102743                          DF2
                                        ;ERROR  7
101452  103461                          EM7
101454  107507                          DH5
101456  102322                          DT5
101460  102743                          DF2
                                        ;ERROR  10
101462  103633                          EM10
101464  107366                          DH1
101466  102252                          DT1
101470  102743                          DF2
```

```
 4459                                   ;ERROR  11
 4460 101472  103677                    EM11
 4461 101474  107664                    DH7
 4462 101476  102362                    DT7
 4463 101500  102767                    DF3
 4464                                   ;ERROR  12
 4465 101502  103677                    EM11
 4466 101504  107664                    DH7
 4467 101506  102362                    DT7
 4468 101510  103004                    DF4
 4469                                   ;ERROR  13
 4470 101512  103721                    EM12
 4471 101514  110145                    DH10
 4472 101516  102444                    DT10
 4473 101520  102743                    DF2
 4474                                   ;ERROR  14
 4475 101522  103677                    EM11
 4476 101524  107664                    DH7
 4477 101526  102362                    DT7
 4478 101530  103021                    DF5
 4479                                   ;ERROR  15
 4480 101532  103677                    EM11
 4481 101534  107664                    DH7
 4482 101536  102362                    DT7
 4483 101540  103036                    DF6
 4484                                   ;ERROR  16
 4485 101542  103745                    EM13
 4486 101544  110307                    DH13
 4487 101546  102504                    DT13
 4488 101550  103103                    DF11
 4489                                   ;ERROR  17
 4490 101552  103777                    EM14
 4491 101554  110307                    DH13
 4492 101556  102504                    DT13
 4493 101560  103103                    DF11
 4494                                   ;ERROR  20
 4495 101562  104043                    EM15
 4496 101564  110307                    DH13
 4497 101566  102504                    DT13
 4498 101570  103103                    DF11
 4499                                   ;ERROR  21
 4500 101572  104111                    EM16
 4501 101574  110243                    DH11
 4502 101576  102466                    DT11
 4503 101600  102743                    DF2
 4504                                   ;ERROR  22
 4505 101602  104137                    EM17
 4506 101604  107664                    DH7
 4507 101606  102362                    DT7
 4508 101610  103021                    DF5
 4509                                   ;ERROR  23
 4510 101612  104177                    EM18
 4511 101614  110006                    DH8
 4512 101616  102416                    DT8
 4513 101620  103076                    DF10
```

```
 4516                                   ;ERROR  24
 4517 101622  104256                    EM19
 4518 101624  110307                    DH13
 4519 101626  102504                    DT13
 4520 101630  103103                    DF11
 4521                                   ;ERROR  25
 4522 101632  104333                    EM20
 4523 101634  110307                    DH13
 4524 101636  102504                    DT13
 4525 101640  103103                    DF11
 4526                                   ;ERROR  26
 4527 101642  000000                    0               ;NO MESSAGE
 4528 101644   10272                    DH12
 4529 101646  102476                    DT12
 4530 101650  102743                    DF2
 4531                                   ;ERROR  27
 4532 101652  104415                    EM21
 4533 101654  110243                    DH11
 4534 101656  102466                    DT11
 4535 101660  102743                    DF2
 4536                                   ;ERROR  30
 4537 101662  104454                    EM22
 4538 101664  110307                    DH13
 4539 101666  102504                    DT13
 4540 101670  103103                    DF11
 4541                                   ;ERROR  31
 4542 101672  000000                    0               ;NO MESSAGE
 4543 101674  110415                    DH14
 4544 101676  102530                    DT14
 4545 101700  102743                    DF2
 4546                                   ;ERROR  32
 4547 101702  104501                    EM23
 4548 101704  107507                    DH5
 4549 101706  102322                    DT5
 4550 101710  102743                    DF2
 4551                                   ;ERROR  33
 4552 101712  106025                    EM38
 4553 101714  110672                    DH17
 4554 101716  102264                    DT2
 4555 101720  103116                    DF13
 4556                                   ;ERROR  34
 4557 101722  104607                    EM25
 4558 101724  110533                    DH15
 4559 101726  102556                    DT16
 4560 101730  103053                    DF7
 4561                                   ;ERROR  35
 4562 101732  104634                    EM26
 4563 101734  110655                    DH16
 4564 101736  102610                    DT17
 4565 101740  102767                    DF3
 4566                                   ;ERROR  36
 4567 101742  103521                    EM8
 4568 101744  110672                    DH17
 4569 101746  102616                    DT18
 4570 101750  103116                    DF13
```

```
4573                                    ;ERROR  37
4574 101752  103556                     EM9
4575 101754  110106                     DH9
4576 101756  102432                     DT9
4577 101760  102743                     DF2
4578                                    ;ERROR  40
4579 101762  104705                     EM27
4580 101764  110655                     DH16
4581 101766  102610                     DT17
4582 101770  103067                     DF8
4583                                    ;ERROR  41
4584 101772  104774                     EM28
4585 101774  110672                     DH17
4586 101776  102634                     DT19
4587 102000  103116                     DF13
4588                                    ;ERROR  42
4589 102002  105624                     EM35
4590 102004  107664                     DH7
4591 102006  102362                     DT7
4592 102010  102767                     DF3
4593                                    ;ERROR  43
4594 102012  105027                     EM29
4595 102014  107664                     DH7
4596 102016  102362                     DT7
4597 102020  102767                     DF3
4598                                    ;ERROR  44
4599 102022  105111                     EM30
4600 102024  107664                     DH7
4601 102026  102362                     DT7
4602 102030  103021                     DF5
4603                                    ;ERROR  45
4604 102032  105230                     EM31
4605 102034  107664                     DH7
4606 102036  102362                     DT7
4607 102040  102767                     DF3
4608                                    ;ERROR  46
4609 102042  105330                     EM32
4610 102044  107664                     DH7
4611 102046  102362                     DT7
4612 102050  102767                     DF3
4613                                    ;ERROR  47
4614 102052  105435                     EM33
4615 102054  107664                     DH7
4616 102056  102362                     DT7
4617 102060  102767                     DF3
4618                                    ;ERROR  50
4619 102062  105543                     EM34
4620 102064  111023                     DH19
4621 102066  102700                     DT22
4622 102070  103114                     DF12
4623                                    ;ERROR  51
4624 102072  105711                     EM36
4625 102074  107615                     DH6
4626 102076  102346                     DT6
4627 102100  102743                     DF2
```

```
 4630                                   ;ERROR  52
 4631 102102  105760                    EM37
 4632 102104  110672                    DH17
 4633 102106  102616                    DT18
 4634 102110  103116                    DF13
 4635                                   ;ERROR  53
 4636 102112  106133                    EM39
 4637 102114  110672                    DH17
 4638 102116  102616                    DT18
 4639 102120  103116                    DF13
 4640                                   ;ERROR  54
 4641 102122  106220                    EM40
 4642 102124  107423                    DH2
 4643 102126  102652                    DT20
 4644 102130  102743                    DF2
 4645                                   ;ERROR  55
 4646 102132  106272                    EM41
 4647 102134  110746                    DH18
 4648 102136  102662                    DT21
 4649 102140  103103                    DF11
 4650                                   ;ERROR  56
 4651 102142  106374                    EM42
 4652 102144  110746                    DH18
 4653 102146  102662                    DT21
 4654 102150  103103                    DF11
 4655                                   ;ERROR  57
 4656 102152  103134                    EM1
 4657 102154  000000                    0
 4658 102156  000000                    0
 4659 102160  000000                    0
 4660                                   ;ERROR  60
 4661 102162  106477                    EM43
 4662 102164  111037                    DH20
 4663 102166  102706                    DT23
 4664 102170  102743                    DF2
 4665                                   ;ERROR  61
 4666 102172  106575                    EM44
 4667 102174  111056                    DH21
 4668 102176  102714                    DT24
 4669 102200  102743                    DF2
 4670                                   ;ERROR  62
 4671 102202  106672                    EM45
 4672 102204  111037                    DH20
 4673 102206  102706                    DT23
 4674 102210  102743                    DF2
 4675                                   ;ERROR  63
 4676 102212  106773                    EM46
 4677 102214  110672                    DH17
 4678 102216  102264                    DT2
 4679 102220  103116                    DF13
 4680                                   ;ERROR  64
 4681 102222  107062                    EM47
 4682 102224  110655                    DH16
 4683 102226  102610                    DT17
 4684 102230  102767                    DF3
```

```
 4687                                        ;ERROR  65
 4688 102232  107170                         EM48
 4689 102234  111063                         DH22
 4690 102236  102652                         DT20
 4691 102240  102743                         DF2
 4692                                        ;ERROR  66
 4693 102242  107267                         EM49
 4694 102244  111111                         DH23
 4695 102246  102720                         DT25
 4696 102250  103125                         DF14
```

```
                                                        .SBTTL  ERROR DATA TAGS (DT)
 4699
 4700 102252  002024  002040  002050  DT1:    .WORD   ERRPC,ADDRESS,GOOD,BAD,0
      102260  002056  000000
 4701 102264  002024  002304  002656  DT2:    .WORD   ERRPC,DUMMY,SLFLAG,SLFLAG+2,SLFLAG+4,SLFLAG+6,0
      102272  002660  002662  002664
      102300  000000
 4702 102302  002024  002042  002074  DT3:    .WORD   ERRPC,PADDRESS,PARCNT,0
      102310  000000
 4703 102312  002024  002040  002072  DT4:    .WORD   ERRPC,ADDRESS,NEMCNT,0
      102320  000000
 4704 102322  002024  177766  177744  DT5:    .WORD   ERRPC,CPUERR,MEMERR,HIADRS,LOADRS,MMR0,MMR1,MMR2,MMR3,0
      102330  177742  177740  177572
      102336  177574  177576  172516
      102344  000000
 4705 102346  002024  002522  002466  DT6:    .WORD   ERRPC,APTCORE,MJSIZE,APTMOS,MKSIZE,0
      102354  002524  002470  000000
 4706 102362  002024  002304  002040  DT7:    .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,GOOD,BAD,BADXOR
      102370  002304  002050  002056
      102376  002064
 4707 102400  002304  002304  002304          .WORD   DUMMY,DUMMY,DUMMY,DUMMY,DUMMY,DUMMY,0
      102406  002304  002304  002304
      102414  000000
 4708 102416  002040  002050  002056  DT8:    .WORD   ADDRESS,GOOD,BAD,GDSWITCH,BDSWITCH,0
      102424  002476  002500  000000
 4709 102432  002024  177766  177744  DT9:    .WORD   ERRPC,CPUERR,MEMERR,CSRNO,0
      102440  002256  000000
 4710 102444  002306  002310  002312  DT10.   .WORD   DETR0,DETR1,DETR2,DETR3,DETR4,DETR5,DETSP,DETPSW,0
      102452  002314  002316  002320
      102460  002322  002324  000000
 4711 102466  002024  002144  002146  DT11:   .WORD   ERRPC,CSR,CSR+2,0
      102474  000000
 4712 102476  002144  002146  000000  DT12:   .WORD   CSR,CSR+2,0
 4713 102504  002024  002304  002040  DT13:   .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,TSTDAT,TSTDAT+2,CHECK,CSR,CSR+2,0
      102512  002304  002344  002346
      102520  002404  002144  002146
      102526  000000
 4714 102530  177744  177750  177746  DT14:   .WORD   MEMERR,MAINT,CONTRL,HIADRS,LOADRS,CPUERR,MMR0,MMR1,MMR2,MMR3,0
      102536  177742  177740  177766
      102544  177572  177574  177576
      102552  172516  000000
 4715 102556  002024  002304  002304  DT16:   .WORD   ERRPC,DUMMY,DUMMY,GOOD,GOOD2,GOOD3
      102564  002050  002052  002054
 4716 102572  002056  002060  002062          .WORD   BAD,BAD2,BAD3,DUMMY,DUMMY,DUMMY,0
      102600  002304  002304  002304
      102606  000000
 4717 102610  002024  002304  000000  DT17:   .WORD   ERRPC,DUMMY,0
 4718 102616  002024  002304  002646  DT18:   .WORD   ERRPC,DUMMY,PORTCOUNT,PORTCOUNT+2,PORTCOUNT+4,PORTCOUNT+6,0
      102624  002650  002652  002654
      102632  000000
 4719 102634  002024  002304  002606  DT19:   .WORD   ERRPC,DUMMY,PORTDIR,PORTDIR+2,PORTDIR+4,PORTDIR+6,0
      102642  002610  002612  002614
      102650  000000
 4720 102652  002024  002050  002056  DT20:   .WORD   ERRPC,GOOD,BAD,0
      102660  000000
 4721 102662  002024  002304  002040  DT21:   .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,GOOD,BAD,0
      102670  002304  002050  002056
      102676  000000
```

ERROR DATA TAGS (DT)

```
 4722 102700  002024  002304  000000  DT22:   .WORD   ERRPC,DUMMY,0
 4723 102706  002024  002056  000000  DT23:   .WORD   ERRPC,BAD,0
 4724 102714  002024  000000          DT24:   .WORD   ERRPC,0
 4725 102720  002024  002304  002646  DT25:   .WORD   ERRPC,DUMMY,PORTCOUNT,PORTCOUNT+2,PORTCOUNT+4,PORTCOUNT+6,BAD,0
      102726  002650  002652  002654
      102734  002056  000000
```

```
4728                                              .SBTTL  ERROR DATA FORMATS (DF)
4729 102740     000     016     016    DF1:      .BYTE   0,14.,14.
4730 102743     000     000     000    DF2:      .BYTE   0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
     102746     000     000     000
     102751     000     000     000
     102754     000     000     000
     102757     000     000     000
     102762     000     000     000
     102765     000     000
4731 102767     000     005     000    DF3:      .BYTE   0,5,0,9.,0,0,0,10.,3,6,2,4,12.
     102772     011     000     000
     102775     000     012     003
     103000     006     002     004
     103003     014
4732 103004     000     005     000    DF4:      .BYTE   0,5,0,9.,0,8.,8.,10.,3,6,2,4,12.
     103007     011     000     010
     103012     010     012     003
     103015     006     002     004
     103020     014
4733 103021     000     005     000    DF5:      .BYTE   0,5,0,9.,11.,11.,11.,10.,3,6,2,4,12.
     103024     011     013     013
     103027     013     012     003
     103032     006     002     004
     103035     014
4734 103036     000     005     000    DF6:      .BYTE   0,5,0,9.,11.,8.,8.,10.,3,6,2,4,12.
     103041     011     013     010
     103044     010     012     003
     103047     006     002     004
     103052     014
4735 103053     000     005     011    DF7:      .BYTE   0,5,9.,0,0,11.,0,0,11.,10.,2,4
     103056     000     000     013
     103061     000     000     013
     103064     012     002     004
4736 103067     000     005            DF8:      .BYTE   0,5
4737 103071     000     001     001    DF9:      .BYTE   0,1,1,1,1
     103074     001     001
4738 103076     000     000     000    DF10:     .BYTE   0,0,0,13.,13.
     103101     015     015
4739 103103     000     005     000    DF11:     .BYTE   0,5,0,9.,0,0,0,0,0
     103106     011     000     000
     103111     000     000     000
4740 103114     000     017            DF12:     .BYTE   0,15.
4741 103116     000     005     000    DF13:     .BYTE   0,5,0,0,0,0,0
     103121     000     000     000
     103124     000
4742 103125     000     005     000    DF14:     .BYTE   0,5,0,0,0,0,16.
     103130     000     000     000
     103133     020
4743                                              .EVEN
```

```
 4746                                                .SBTTL  ERROR MESSAGES (EM)
 4752 103134  125  116  105  EM1:    .ASCIZ  /UNEXPECTED TRAP TO 170 (IIST) - PROGRAM CONTINUING./
 4753 103220  103  101  116  EM2:    .ASCIZ  /CAN'T SET 22 BIT MODE IN MMR3/
 4754 103256  120  101  122  EM3:    .ASCIZ  /PARITY ERROR(S) IN BANK 0)/
 4755 103311  116  117  116  EM4:    .ASCIZ  /NON-EXISTANT MEMORY (HOLES) IN BANK 0/
 4756 103357  111  114  114  EM5:    .ASCIZ  /ILLEGAL OR RESERVED INSTRUCTION (TRAP TO 10)/
 4757 103434  125  116  105  EM6:    .ASCIZ  /UNEXPECTED TRAP TO 4/
 4758 103461  115  105  115  EM7:    .ASCIZ  /MEMORY MANAGEMENT (TRAP TO 250)/
 4759 103521  120  117  122  EM8:    .ASCIZ  /PORT CONTENTION NOT BALANCED/
 4760
 4761 103556  116  117  116  EM9:    .ASCIZ  /NON-EXISTANT CSR CAUSED INCORRECT ERROR TRAP/
 4762 103633  111  116  103  EM10:   .ASCIZ  /INCORRECT DATA FROM DEVICE REGISTER/
 4763 103677  115  105  115  EM11.   .ASCIZ  /MEMORY DATA ERROR/
 4764 103721  104  105  124  EM12:   .ASCIZ  /DETAILED ERROR DUMP/
 4765 103745  115  111  123  EM13:   .ASCIZ  /MISSING EXPECTED SBE FLAG/
 4766 103777  127  122  111  EM14:   .ASCIZ  /WRITE BYTE FAILED TO CLEAR SBE FLAG/
 4767 104043  106  101  111  EM15:   .ASCIZ  /FAILED TO GET INTERRUPT WITH DBE FLAG/
 4768 104111  117  116  114  EM16:   .ASCIZ  /ONLY ONE DBE FLAG SET/
 4769 104137  115  105  115  EM17:   .ASCIZ  /MEMORY DATA ERROR IN CHECK BITS/
 4770 104177  123  131  123  EM18:   .ASCIZ  /SYSTEM SIZE REGISTER LOW DOES NOT MATCH MEMORY/
 4771 104256  123  102  105  EM19:   .ASCIZ  /SBE OR DBE CAUSED PARITY TRAP WHEN INHIBITED/
 4772 104333  123  102  105  EM20:   .ASCIZ  /SBE OR DBE DID NOT CAUSE PARITY TRAP WHEN ENABLED/
 4773 104415  123  102  105  EM21:   .ASCIZ  /SBE OR DBE ON MASTER TEST WORD/
 4774 104454  115  111  123  EM22:   .ASCIZ  /MISSING EXPECTED DBE/
 4775 104501  125  116  105  EM23:   .ASCIZ  /UNEXPECTED PARITY TRAP/
 4776 104530  122  105  103  EM24:   .ASCIZ  /RECEIVED DBE FLAG WHEN EXPECTING ONLY SBE FLAG/
 4777 104607  103  110  105  EM25:   .ASCIZ  /CHECK BIT DATA ERROR/
 4778 104634  101  104  104  EM26:   .ASCIZ  /ADDRESS PARITY ERROR DID NOT CAUSE ABORT/
 4779 104705  115  113  061  EM27:   .ASCIZ  /MK11 PROTECTION POINTER FAILURE - DID NOT PROTECT BANK/
 4780 104774  103  120  125  EM28:   .ASCIZ  /CPU IDENTIFICATION FAILURE/
 4781 105027  103  117  122  EM29:   .ASCIZ  /CORRECTION FAILURE WITH ECC ENABLED ON FORCED SBE/
 4782 105111  127  122  111  EM30:   .ASCII  /WRITE BYTE (MOVB) WITH ECC ENABLED FAILED TO CLEAR DATA AT/<CRLF>
 4783 105204  106  117  122          .ASCIZ  /FORCED SBE LOCATION/
 4784 105230  101  123  122  EM31:   .ASCIZ  /ASRB (R3)+ WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
 4785 105330  115  117  126  EM32:   .ASCIZ  /MOVB #360,(R2)+ WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
 4786 105435  115  117  126  EM33:   .ASCIZ  /MOV #177400,(R1) WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
 4787 105543  123  102  105  EM34:   .ASCIZ  /SBE DETECTED BY MK11 BUT NOT ISOLATED BY PROGRAM/
 4788 105624  125  116  105  EM35:   .ASCIZ  /UNEXPECTED CORRECTION WITH ECC DISABLE ON FORCED SBE/
 4789 105711  101  120  124  EM36:   .ASCIZ  /APT SIZE DISAGREES WITH PROGRAM SIZING/
 4790 105760  122  125  116  EM37:   .ASCIZ  /RUNNING CONTENTION INCREMEMT FAILURE/
 4791 106025  101  123  122  EM38:   .ASCIZ  /ASRB LOCK FAILURE (1 & ONLY 1 CPU SHOULD HAVE LOCKED) (LOCKED = ONES)/
 4792 106133  101  123  122  EM39:   .ASCIZ  /ASRB LOCK BALANCE FAILURE (# OF LOCKS PER CPU BELOW)/
 4793 106220  102  122  101  EM40:   .ASCIZ  /BRANCH GOBBLE FAILED CONDITION CODES TEST/
 4794 106272  123  124  101  EM41:   .ASCIZ  /STALE DATA COULD NOT BE CREATED - CACHE FAILURE NOT MAIN MEMORY. /
 4795 106374  103  101  103  EM42:   .ASCIZ  /CACHE COULD NOT FLUSH STALE DATA - CACHE FAILURE NOT MAIN MEMORY../
 4796 106477  123  114  101  EM43:   .ASCIZ  /SLAVE DID NOT RESPOND IN TIME - ABORTING MULTIPROCESSOR TESTS/
 4797 106575  111  111  123  EM44:   .ASCIZ  /IIST DID NOT RESPOND IN TIME - ABORTING MULTIPROCESSOR TESTS/
 4798 106672  116  117  124  EM45:   .ASCIZ  /NOT ENOUGH GOOD MEMORY FOR SLAVE - ABORTING MULTIPROCESSOR TESTS/
 4799 106773  10*  114  114  EM46:   .ASCIZ  /ALL CPUS NOT SHARING A MEMORY BANK (ACCESSABLE = ONES)/
 4800 107062  103  123  122  EM47:   .ASCIZ  /CSR CONFIGURATION ERROR - PROBABLY CSR SWITCHES IN BOX ARE SET WRONG /
 4801 107170  101  120  124  EM48:   .ASCIZ  /APT EXPECTS DIFFERENT NUMBER OF CPU'S THAN DIAGNOSTIC CAN BOOT/
 4802 107267  120  117  122  EM49:   .ASCIZ  /PORT CONTENTION BALANCED WITH 3 CPU'S RAISED TO HIGH PRIORITY/
 4803                                .EVEN
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4806                                                    .SBTTL  ERROR DATA HEADERS (DH)
4807 107366    040     040     120     DH1:    .ASCIZ  /  PC    DEV ADD   GOOD    BAD/
4808 107423    040     040     120     DH2:    .ASCIZ  /  PC    GD-CC BD-CC/
4809 107446    040     040     120     DH3:    .ASCIZ  /  PC    1ST ADD  # OF ERRORS/
4810 107502    040     040     120     DH4:    .ASCIZ  /  PC/
4811 107507    040     040     120     DH5:    .ASCII  /  PC     CPUERR  MEMERR  HIADRS  LOADRS/
4812 107555    040     040     040             .ASCIZ  /   MMR0     MMR1     MMR2     MMR3/
4813 107615    040     040     120     DH6:    .ASCIZ  /  PC    APTCORE  MJSIZE  APTMOS  MKSIZE/
4814 107664    040     040     120     DH7:    .ASCII  /  PC     BANK  VADD     PADD     GOOD/
4815 107730    040     040     040             .ASCIZ  /      BAD      XOR  MAR BOX MTYPE INT PAT ARRAY/
4816 110006    104     105     126     DH8:    .ASCIZ  /DEV ADD    GOOD     BAD      GDSWITCH    BDSWI'CH  NOTE. (OFF - 1)/
4817 110106    040     040     120     DH9:    .ASCIZ  /  PC     CPUERR  MEMERR  CSRNUM/
4818 110145    040     040     122     DH10.   .ASCIZ  /  R0       R1       R2       R3       R4       R5       SP       PSW/
4819 110243    040     040     120     DH11:   .ASCIZ  /  PC       CSR     CSR+2/
4820 110272    040     103     123     DH12:   .ASCIZ  / CSR    CSR+2/
4821 110307    040     040     120     DH13:   .ASCII  /  PC     BANK  VADD     PADD    WROTE1  WROTE2/
4822 110364    040     103     110             .ASCIZ  / CHKBITS     CSR     CSR+2/
4823 110415    115     105     115     DH14:   .ASCII  /MEMERR   MAINT  CONTRL  HIADRS  LOADRS  CPUERR/
4824 110473    040     040     040             .ASCIZ  /   MMR0     MMR1     MMR2     MMR3/
4825 110533    040     040     120     DH15:   .ASCII  /  PC     BANK    PADD   GD-WD1  GD-WD2  GD-CHK/
4826 110610    040     102     101             .ASCIZ  / BAD-WD1 BAD-WD2 BAD-CHK MAR INT PAT/
4827 110655    040     040     120     DH16:   .ASCIZ  /  PC     BANK/
4828 110672    040     040     120     DH17:   .ASCIZ  /  PC     BANK MASTER  SLAVE1  SLAVE2  SLAVE3/
4829 110746    040     040     120     DH18:   .ASCIZ  /  PC     BANK  VADD     PADD     GOOD     BAD/
4830 111023    040     040     120     DH19:   .ASCIZ  /  PC   ARRAY/
4831 111037    040     040     120     DH20:   .ASCIZ  /  PC     SLAVE#/
4832 111056    040     040     120     DH21:   .ASCIZ  /  PC/
4833 111063    040     040     120     DH22:   .ASCIZ  /  PC     REAL#    APT#/
4834 111111    040     040     120     DH23:   .ASCIZ  /  PC     BANK MASTER  SLAVE1  SLAVE2  SLAVE3  LOW-CPU/
4835                                            .EVEN
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                                      .SBTTL  MESSAGES
111176  200  103  105  MSG000:  .ASCIZ  <CRLF>/CEMKABO 1170 MAIN MEMORY DIAGNOSTIC <V14-00>/
111254  200  040  040  MSG001:  .ASCIZ  <CRLF>/                         MEMORY CONFIGURATION MAP/
111336  200  040  040  MSG002:  .ASCIZ  <CRLF>/                                16K WORD BANKS/
111413  200  040  040  MSG003:  .ASCII <CRLF>/                   1       2       3/
111455  040  040  040           .ASCIZ  /       4       5       6       7  /
111520  200  040  040  MSG004:  .ASCII <CRLF>/          01234567012345670123456 7/
111561  060  061  062           .ASCIZ  /01234567012345670123456701234567 0123/
111626  200  105  122  MSG005:  .ASCIZ  <CRLF>/ERRORS  /
111640  200  125  116  MSG006:  .ASCIZ  <CRLF>/UNDEFINED TRAP INSTRUCTION/<32>
111675  200  111  116  MSG007:  .ASCIZ  <CRLF>/INTRLV  /
111707  200  103  120  MSG008:  .ASCIZ  <CRLF>/CPU MAP / ;HEXADECIMAL(1=MASTER;2=SLAVE1;4=SLAVE2;8=SLAVE3)
111721  200  115  105  MSG009:  .ASCIZ  <CRLF>/MEMTYPE /                ;MEMORY TYPE (0=MJ11;1=MK11)
111733  200  120  122  MSG010:  .ASCIZ  <CRLF>/PROTECT /                ;MEMORY PROTECTED
111745  040  040  040  MSG011:  .ASCIZ  /   0       1       2       3       4       5       6/
112033  064  065  066  MSG012:  .ASCIZ  /4567012345670123456701234567012345670123456701234567/
112130  130  000       MSG013:  .ASCIZ  /X/
112132  040  000       MSG014:  .ASCIZ  / /             ;SPACE
112134  000  000       MSG015:  .BYTE   0,0             ;FOR SINGLE ASCII CHARACTERS & TERMINATOR
112136  200  102  117  MSG016:  .ASCIZ  <CRLF>/BOX      /
112150  040  040  040  MSG017:  .ASCIZ  /        /                ;8 SPACES
112161  040  040  000  MSG018:  .ASCIZ  /  /                      ;2 SPACES
112164  040  040  040  MSG019:  .ASCIZ  /   /                     ;3 SPACES
112170  200  106  111  MSG020:  .ASCIZ  <CRLF>/FIELD SERVICE COMMAND MODE/
112224  200  103  117  MSG021:  .ASCII  <CRLF>/COMMANDS AVAILABLE ARE:/
112254  200  060  040           .ASCII  <CRLF>/0 = EXIT FIELD SERVICE COMMANDS/
112314  200  061  040           .ASCII  <CRLF>/1 = READ CSR/
112331  200  062  040           .ASCII  <CRLF>/2 = LOAD CSR/
112346  200  063  040           .ASCII  <CRLF>/3 = EXAMINE MEMORY/
112371  200  064  040           .ASCII  <CRLF>/4 = MODIFY MEMORY/
112413  200  065  040           .ASCII  <CRLF>/5 = SELECT BANK,MARGIN, & PATTERN/
112455  200  066  040           .ASCII  <CRLF>/6 = TYPE CONFIGURATION MAP/
112510  200  067  040           .ASCII  <CRLF>'7 = BATTERY BACKUP - P/F TEST''
112546  200  070  040           .ASCII  <CRLF>/8 = SOB-A-LONG TEST/
112572  200  071  040           .ASCII  <CRLF>/9 = SUPER TIGHT SCOPE LOOP/
112625  200  061  060           .ASCII  <CRLF>/10= ERROR SUMMARY/
112647  200  061  061           .ASCII  <CRLF>/11= REFRESH TEST/
112670  200  061  062           .ASCII  <CRLF>/12= SET FILL COUNT/
112713  200  061  063           .ASCII  <CRLF>/13= ENTER KAMIKAZE MODE/
112743  200  061  064           .ASCII  <CRLF>/14= EXIT KAMIKAZE MODE/
112772  200  061  065           .ASCII  <CRLF>/15= TURN CACHE OFF/
113015  200  061  066           .ASCII  <CRLF>/16= TURN CACHE ON/
113037  200  061  067           .ASCII  <CRLF>/17= RUN ONLY MULTIPORT TESTS/
113074  200  061  070           .ASCII  <CRLF>/18= RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS/
113155  200  061  071           .ASCII  <CRLF>/19= TEST ONLY SELECTED BANKS/
113212  200  062  060           .ASCII  <CRLF>/20= RESUME TESTING ALL BANKS/
113247  015  012  000           .BYTE   15,12,0
113252  200  127  110  MSG022:  .ASCIZ  <CRLF>/WHICH CSR(0-7)? /
113274  200  103  123  MSG023:  .ASCIZ  <CRLF>/CSR - 1ST WORD? /
113316  200  103  123  MSG024:  .ASCIZ  <CRLF>/CSR - 2ND WORD? /
113340  200  124  110  MSG025:  .ASCIZ  <CRLF>/THIS CSR DOES NOT EXIST/
113371  200  103  117  MSG026:  .ASCIZ  <CRLF>/COMMAND:/
113403  200  117  114  MSG027:  .ASCIZ  <CRLF>/OLD CSR WAS/
113420  200  103  123  MSG028:  .ASCIZ  <CRLF>/CSR IS NOW/
113434  200  105  130  MSG029:  .ASCIZ  <CRLF>/EXAMINE MEMORY/
113454  200  102  101  MSG030:  .ASCIZ  <CRLF>/BANK(0-167)? /
113473  200  120  110  MSG031:  .ASCIZ  <CRLF>/PHYSICAL ADDRESS(0-16777776)?
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4895 113533  200  120  101  MSG032: .ASCIZ  <CRLF>/PARITY ABORT/<32>
4896 113552  200  124  111  MSG033: .ASCIZ  <CRLF>/TIMEOUT TRAP/<32>
4897 113571  200  102  131  MSG034: .ASCII  <CRLF>/BYPASSING CSR TESTS ON BOX /
4898 113625  000            MSGA34: .BYTE   0
4899 113626  040  103  117          .ASCII  / CONTROLLER /
4900 113642  000            MSGB34: .BYTE   0
4901 113643  200  104  125          .ASCIZ  <CRLF>/DUE TO LACK OF SBE FREE LOCATIONS/<32>
4902 113707  12'  126  000  MSG035: .ASCIZ  /QV/
4903 113712  200  115  117  MSG036: .ASCIZ  <CRLF>/MODIFY MEMORY/
4904 113731  200  117  114  MSG037: .ASCIZ  <CRLF>/OLD DATA WAS /
4905 113750  200  104  101  MSG038: .ASCIZ  <CRLF>/DATA IS NOW /
4906 113766  200  111  116  MSG039: .ASCIZ  <CRLF>/INPUT NEW DATA? /
4907 114010  200  123  105  MSG040: .ASCIZ  <CRLF>/SELECT BANK, MARGIN, & PATTERN TEST/
4908 114055  200  102  101  MSG041: .ASCIZ  <CRLF>/BANK NOT ACCESSABLE/
4909 114102  200  120  101  MSG042: .ASCIZ  <CRLF>/PATTERN(0-37)? /
4910 114123  200  120  101  MSG043: .ASCIZ  <CRLF>/PATTERN 0 DATA IS? /
4911 114150  200  115  101  MSG044. .ASCIZ  <CRLF>/MARGIN(0,2,3,4,5)? /
4912 114175  200  115  101  MSG045: .ASCIZ  <CRLF>/MARGINS INHIBITED BY SW11!/
4913 114231  200  124  117  MSG046: .ASCIZ  <CRLF>/TO ESCAPE TYPE ANY KEY/<CRLF><12><12>
4914 114264  200  124  105  MSG047: .ASCIZ  <CRLF>/TEST COMPLETE/
4915 114303  040  116  117  MSG048: .ASCIZ  / NOT AVAILABLE NOW - TRY LATER!/
4916 114343  200  102  101  MSG049: .ASCIZ  <CRLF>/BANK REQUIRES RELOCATION/
4917 114375  200  102  101  MSG050: .ASCII  <CRLF>/BATTERY BACKUP TEST/
4918 114421  200  127  122          .ASCIZ  <CRLF>/WRITING & CHECKING ADDRESS PATTERN AS BACKGROUND/
4919 114503  200  120  117  MSG051: .ASCIZ  <CRLF>/POWER RECOVERY/
4920 114523  200  122  105  MSG052: .ASCIZ  <CRLF>/REMOVE SYSTEM POWER FOR/
4921 114554  040  123  105  MSG053: .ASCIZ  / SECONDS MAX!/
4922 114572  200  116  117  MSG054. .ASCIZ  <CRLF>/NOW STARTING READ TEST OF MEMORY BANKS/
4923 114642  200  123  117  MSG055: .ASCIZ  <CRLF>/SOB-A-LONG TEST/
4924 114663  200  102  105  MSG056: .ASCIZ  <CRLF>/BELL - EACH PASS COMPLETE/
4925 114716  040  077  040  MSG057: .ASCIZ  / ? /
4926 114722  200  040  040  MSG058: .ASCIZ  <CRLF>/  CSR    CSR+2    CSR    CSR+2 .../
4927 114766  200  123  125  MSG059: .ASCIZ  <CRLF>/SUPER TIGHT SCOPE LOOP/
4928 115016  200  123  127  MSG060: .ASCIZ  <CRLF>/SWREG ---> MEM, MEM ---> DISPLAY/
4929 115060  077  077  077  MSG061: .ASCIZ  /??????/
4930 115067  111  116  120  MSG062: .ASCIZ  /INPUT MUST BE A/
4931 115107  116  040  117  MSG063: .ASCIZ  /N OCTAL /
4932 115120  116  125  115  MSG064: .ASCIZ  /NUMBER/<CRLF>
4933 115130  040  104  105  MSG065: .ASCIZ  / DECIMAL /
4934 115142  200  105  122  MSG066: .ASCIZ  <CRLF>/ERROR COUNT EXCEEDED 20 - ABORTING FOR XXDP CHAIN/
4935 115225  106  101  124  MSG067: .ASCIZ  /FATAL /
4936 115234  115  112  061  MSG068: .ASCIZ  /MJ11/
4937 115241  115  113  061  MSG069: .ASCIZ  /MK11/
4938 115246  113  040  127  MSG070: .ASCIZ  /K WORDS OF MEMORY/<CRLF>
4939 115271  113  040  117  MSG071: .ASCIZ  /K OF MJ11/<CRLF>
4940 115304  113  040  117  MSG072: .ASCIZ  /K OF MK11/<CRLF>
4941 115317  200  122  105  MSG073: .ASCIZ  <CRLF>/REFRESH TEST/
4942                              .EVEN   ;THIS STAYS WITH MSG074
4943 115336  077  077  000  MSG074: .ASCIZ  /??/
4944 115341  200  122  105  MSG075: .ASCIZ  <CRLF>/RELOCATION NOT POSSIBLE/<32>
4945 115373  200  040  040  MSG076: .ASCIZ  <CRLF>/  BANK  ERRORS/<CRLF>
4946 115414  200  105  116  MSG077: .ASCIZ  <CRLF>/END PASS #/
4947 115430  200  127  101  MSG078: .ASCIZ  <CRLF>/WARNING.  ECC IS DISABLED ON BOX /<32>
4948 115474  040  105  122  MSG079: .ASCIZ  / ERROR(S) DETECTED/<CRLF>
4949 115520  200  105  116  MSG080: .ASCIZ  <CRLF>/ENTER # OF SLAVE CPU'S (0-3)? /
4950 115560  200  123  124  MSG081: .ASCIZ  <CRLF>/START SLAVE #/
4951 115577  040  '01  124  MSG082: .ASCIZ  / AT ADDRESS 200/
```

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 4952 115617      200      120      122  MSG084: .ASCIZ  <CRLF>/PROCEEDING AS A SINGLE PORT TEST/
 4953 115661      200      106      111  MSG085: .ASCIZ  <CRLF>/FILL COUNT(OCTAL)? /
 4954 115706      200      115      125  MSG086: .ASCII  <CRLF>/MULTIPORT DIRECTORY/
 4955 115732      200      115      101          .ASCIZ  <CRLF>/MASTER - /
 4956 115745      200      123      114  MSG087: .ASCII  <CRLF>/SLAVE/
 4957 115753      060                    MSGA87: .BYTE   '0
 4958 115754      040      075      040          .ASCIZ  '/ = /
 4959 115760      200      113      105  MSG088: .ASCIZ  <CRLF>/KERNEL STACK/
 4960 115776      200      123      125  MSG089: .ASCIZ  <CRLF>/SUPERVISOR STACK/
 4961 116020      200      125      123  MSG090: .ASCIZ  <CRLF>/USER STACK/
 4962 116034      040      111      123  MSG091: .ASCIZ  / IS EMPTY'
 4963 116046      122      105      114  MSG092: .ASCIZ  /RELOCATED  /
 4964 116062      102      101      116  MSG093: .ASCIZ  /BANK=/
 4965 116070      040      040      115  MSG094: .ASCIZ  /  MAR=/
 4966 116077      040      040      120  MSG095: .ASCIZ  /  PAT=/
 4967 116106      200      114      117  MSG096: .ASCIZ  <CRLF>/LOADERS BEING DESTROYED/
 4968 116137      200      127      101  MSG097: .ASCIZ  <CRLF>/WARNING.  ILLEGAL INTERLEAVE SELECTED (FIELD SERVICE ONLY)/<32>
 4969 116234      200      123      114  MSG098: .ASCII  <CRLF>/SLAVE/
 4970 116242      000                    MSGA98: .BYTE   0
 4971 116243      076      000                  .ASCIZ  />/
 4972 116245      200      115      101  MSG099: .ASCIZ  <CRLF>/MASTER>/
 4973 116256      200      115      125  MSG100: .ASCIZ  <CRLF>/MULTIPROCESSOR TEST #/
 4974 116305      200      105      116  MSG101: .ASCIZ  <CRLF>/ENTERING KAMIKAZE MODE/
 4975 116335      200      114      105  MSG102: .ASCIZ  <CRLF>/LEAVING KAMIKAZE MODE/
 4976 116364      200      114      105  MSG103: .ASCIZ  <CRLF>/LEAVING FIELD SERVICE MODE/<CRLF>
 4977 116421      032      000          MSG104: .BYTE   32,0                            ;CONTROL Z
 4978 116423      200      105      116  MSG105: .ASCIZ  <CRLF>/ENTER BANKS IN OCTAL - USE NUMBER OUTSIDE RANGE TO TERMINATE (177)/
 4979 116527      200      103      101  MSG106: .ASCIZ  <CRLF>/CACHE IS OFF/
 4980 116545      200      103      101  MSG107: .ASCIZ  <CRLF>/CACHE IS ON (EXCEPT DURING ACTUAL PATTERNS)/
 4981 116622      200      117      116  MSG108: .ASCIZ  <CRLF>/ONLY MULTIPORT TESTS WILL BE RUN/
 4982 116664      200      102      117  MSG109: .ASCIZ  <CRLF>/BOTH SINGLE & MULTIPORT TESTS WILL BE RUN/
 4983 116737      200      117      116  MSG110: .ASCIZ  <CRLF>/ONLY SELECTED BANKS WILL BE TESTED/
 4984 117003      200      101      114  MSG111: .ASCIZ  <CRLF>/ALL BANKS WILL BE TESTED/
 4985 117035      200      120      122  MSG112: .ASCIZ  <CRLF>/PROGRAM HALTING BECAUSE OF SWITCH #8/
 4986 117103      040      115      101  MSG113: .ASCIZ  / MASTER/
 4987 117113      040      123      11.  MSG114: .ASCIZ  / SLAVE1/
 4988 117123      040      123      114  MSG115: .ASCIZ  / SLAVE2/
 4989 117133      040      123      114  MSG116: .ASCIZ  / SLAVE3/
 4990                                           .EVEN
 4996 117144                                    $$END
 4997 117144                             END:
 4998 117144  000406                             .PRINT  60000-SUPLIMIT  ;SUPERVISOR ADDRESSES LEFT
 5003 117144  002004                             .PRINT  100000-SLAVEND  ;ADDRESSES LEFT IN SLAVE UNIQUE CODE
 5008 117144  020634                             .PRINT  140000-END      ;ADDRESSES LEFT IN 24K
 5012         000200                             .END START3
```

SYMBOL TABLE

```
ABORTF  002142    BIT4  = 000020    B144  062364    B36   024446    CMD20A  050576
ACFLAG  002124    BIT5  = 000040    B145  062450    B37   024452    CMD5A   045456
ACK     002672    BIT6  = 000100    B146  062572    B4    010550    CMD5B   045666
ACTFLA  002442    BIT7  = 000200    B147  062630    B40   024616    CMD5C   046052
ADDPAR  014570    BIT8  = 000400    B15   013004    B41   024624    CMD7A   046336
ADDRES  002040    BIT9  = 001000    B150  062632    B42   025034    CMD8A   046550
ADD..0  071152    BLOCK1  043710    B151  062674    B43   033412    CMD8B   046740
ADD..1  071162    BLOCK2  043730    B152  063032    B44   033450    CMD8C   047014
ADD..2  071202    BLOCK3  043744    B153  063070    B45   033464    CMD9A   047240
ADD..3  071232    BMFLAG  002136    B154  063120    B46   033604    CMD9B   047456
ADD..4  071262    BOOT    043416    B155  063170    B47   033764    CMD9C   047464
ADD..5  071264    BOOTLO= 000012    B156  063172    B5    010554    CMD9LO  047444
ADD..6  071304    BOOT1   043460    B157  063330    B50   034006    CONFGE  002576
ADD..7  071334    BRGOBB  035112    B16   013014    B51   040014    CONFGT  006666
ALLCPU  002510    B0      005500    B160  063404    B52   040020    CONFG1  006304
APTCOR  002522    B1      007742    B161  063410    B53   040160    CONFG3  006520
APTDOW  043640    B10     011352    B162  063472    B54   040164    CONFG5  006712
APTFLA  002444    B100    053774    B163  063522    B55   040450    CONFIE  004336
APTHAN  015050    B101    054102    B164  063602    B56   040454    CONFIG  003016
APTHLT  043706    B102    054146    B165  063604    B57   041144    CONFSP  006754
APTMOS  002524    B103    054226    B166  063754    B6    010642    CONTFL  002332
APTSIZ  002544    B104    054234    B167  064016    B60   041152    CONTP   073112
ASRBAL- 000110    B105    054256    B17   013016    B61   041302    CONTRL= 177746
A3      - 000002  B106    054370    B170  064052    B62   041306    CONTS   073544
BACKGN  035344    B107    054416    B171  064122    B63   042530    CONTS1  073052
BAD     002056    B11     011360    B172  064124    B64   046374    CONTS2  073546
BADCSR  002000    B110    054472    B173  064246    B65   046744    CONTT   073404
BADPC   002026    B111    054474    B174  064260    B66   047612    COREHI  043300
BADPSW  002036    B112    055374    B175  064316    B67   050170    COUNT   002462
BADSP   002032    B113    055400    B176  064372    B7    010732    CPUBIT  002114
BADSTA  036770    B114    055700    B177  064512    B70   050512    CPUERR= 177766
BADXOR  002064    B115    055706    B2    010312    B71   050512    CPUID   011656
BAD2    002060    B116    057452    B20   013124    B72   050600    CR    = 000015
BAD3    002062    B117    057474    B200  070344    B73   050752    CRLF  = 000200
BAFPAF  015204    B12     012140    B201  070436    B74   053016    CSR     002144
BAFPAR  015320    B120    057622    B202  070736    B75   053024    CSRCAS  020114
BAKPAT  002762    B121    057756    B203  070740    B76   053660    CSRFB   002214
BALANC- 000155    B122    060072    B204  071610    B77   053710    CSRFBA  002410
BANK    002106    B123    060244    B205  071614    CACHK   002700  CSRFIR  002336
BANKIN  002110    B124    060256    B206  071730    CACHOF= 104424    CSRINC  002414
BANKMO  042072    B125    060264    B207  072012    CACHON= 104423    CSRIND  002416
BANKOK  042730    B126    060514    B21   013220    CACHVE= 000114    CSRLB   002234
BAWPAF  015434    B127    060754    B210  072076    CBCSR = 104474    CSRLBA  002412
BAWPAR  015572    B13     012144    B211  072174    CB1CSR= 104475    CSRLOO  002420
BDSWIT  002500    B130    061340    B22   013270    CHECK   002404  CSRNO   002256
BEGIN   005752    B131    061352    B23   013632    CHKDIS= 104504    CSROUD  002417
BGTEST  035110    B132    061412    B24   014144    CHKGEN  040540  CSROUT  040442
BIT0  = 000001    B133    061520    B25   014512    CHKTAB  040640  CSRREL  002254
BIT1  - 000002    B134    061572    B26   015114    CHK1DI= 104505    CSRSTU= 000031
BIT10 = 002000    B135    061724    B27   016722    CKEND   073316  CSR0    002154
BIT11 = 004000    B136    061736    B3    010316    CKSWR = 104410    CSR2    002174
BIT12 = 010000    B137    061774    B30   016744    CLRCSR= 104502    DATBUF  002340
BIT13 = 020000    B14     012556    B31   016750    CLR1CS= 104503    DBEMSK  002354
BIT14 = 040000    B140    062102    B32   016762    CMD11A  047774    DDISP = 177570
BIT15 = 100000    B141    062154    B33   017044    CMD11B  050164    DECMAR  043152
BIT2    000004    B142    062312    B34   017060    CMD11C  050240    DEENER- 104421
BIT3  = 000010    B143    062350    B35   023232    CMD19L= 000070    DETAIL  071364
```

SYMBOL TABLE

SEQ 0554

DETFLA	002326	DT13	102504	EM37	105760	E121	060040	E203	071110
DETPSW	002324	DT14	102530	EM38	106025	E122	060212	E204	071670
DETR0	002306	DT16	102556	EM39	106133	E123	060460	E205	071670
DETR1	002310	DT17	102610	EM4	103311	E124	060450	E206	071760
DETR2	002312	DT18	102616	EM40	106220	E125	060432	E207	072044
DETR3	002314	DT19	102634	EM41	106272	E126	060536	E21	013244
DETR4	002316	DT2	102264	EM42	106374	E127	061006	E210	072130
DETR5	002320	DT20	102652	EM43	106477	E13	012530	E211	072330
DETSP	002322	DT21	102662	EM44	106575	E130	061702	E22	013620
DF1	102740	DT22	102700	EM45	106672	E131	061672	E23	013714
DF10	103076	DT23	102706	EM46	106773	E132	061656	E24	014264
DF11	103103	DT24	102714	EM47	107062	E133	061540	E25	014562
DF12	103114	DT25	102720	EM48	107170	E134	061646	E26	015202
DF13	103116	DT3	102302	EM49	107267	E135	062264	E27	017256
DF14	103125	DT4	102312	EM5	103357	E136	062254	E3	010364
DF2	102743	DT5	102322	EM6	103434	E137	062240	E30	017230
DF3	102767	DT6	102346	EM7	103461	E14	012716	E31	017166
DF4	103004	DT7	102362	EM8	103521	E140	062122	E32	017166
DF5	103021	DT8	102416	EM9	103556	E141	062230	E33	017152
DF6	103036	DT9	102432	ENASBE=	104506	E142	062544	E34	017122
DF7	103053	DUMMY	002304	ENA1SB=	104507	E143	062530	E35	023316
DF8	103067	DUMPCS=	000204	END	117144	E144	062436	E36	024574
DF9	103071	ECCDIS=	104470	ENERGI=	104420	E145	062520	E37	024560
DH1	107366	ECCINI=	104472	ERRMAX	002702	E146	062772	E4	010612
DH10	110145	ECC1DI=	104471	ERROR =	104000	E147	062756	E40	024746
DH11	110243	ECC1IN=	104473	ERRPC	002024	E15	013066	E41	024732
DH12	110272	EMTVEC=	000030	ERRPSW	002034	E150	062662	E42	025112
DH13	110307	EM1	103134	ERRSP	002030	E151	062744	E43	033756
DH14	110415	EM10	103633	ERRVEC=	000004	E152	063254	E44	033742
DH15	110533	EM11	103677	EVEN	002456	E153	063112	E45	033556
DH16	110655	EM12	103721	EXBANK	042422	E154	063170	E46	033726
DH17	110672	EM13	103745	EXCMD3	044726	E155	063240	E47	034002
DH18	110746	EM14	103777	EXCMD4	045236	E156	063240	E5	010612
DH19	111023	EM15	104043	EXIT	043522	E157	063576	E50	034026
DH2	107423	EM16	104111	EXIT2	043526	E16	013066	E51	040066
DH20	111037	EM17	104137	E0	005530	E160	063562	E52	040066
DH21	111056	EM18	104177	E1	010242	E161	063470	E53	040232
DH22	111063	EM19	104256	E10	011444	E162	063514	E54	040232
DH23	111111	EM2	103220	E100	054364	E163	063542	E55	040504
DH3	107446	EM20	104333	E101	054124	E164	063672	E56	040504
DH4	107502	EM21	104415	E102	054216	E165	063672	E57	041302
DH5	107507	EM22	104454	E103	054342	E166	064174	E6	010672
DH6	107615	EM23	104501	E104	054330	E167	064044	E60	041262
DH7	107664	EM24	104530	E105	054304	E17	013056	E61	041442
DH8	110006	EM25	104607	E106	054412	E170	064122	E62	041422
DH9	110106	EM26	104634	E107	054466	E171	064160	E63	042562
DIAGFL	002006	EM27	104705	E11	011432	E172	064160	E64	046456
DISPLA	002770	EM28	104774	E110	054542	E173	064466	E65	047006
DISPRE=	000174	EM29	105027	E111	054542	E174	064456	E66	047720
DISPTB	014370	EM3	103256	E112	055440	E175	064354	E67	050232
DNSLAV	055170	EM30	105111	E113	055440	E176	064442	E7	011076
DOBACK	015104	EM31	105230	E114	055746	E177	064570	E70	050552
DSWR =	177570	EM32	105330	E115	055746	E2	010364	E71	050552
DT1	102252	EM33	105435	E116	057602	E20	013160	E72	050626
DT10	102444	EM34	105543	E117	057516	E200	070402	E73	051042
DT11	102466	EM35	105624	E12	012530	E201	070474	E74	053074
DT12	102476	EM36	105711	E120	057752	E202	071110	E75	053062

SYMBOL TABLE

```
E76     053734          IIII  = 177777          KI2     002554          L1017   070542          L13     005376
E77     053730          IISTAC  002736          KI3     002556          L102    011414          L130    012700
FASTCI= 177640          IISTAD  002740          KI4     002560          L1020   070602          L131    012764
FATAL$  002070          IISTIN  061074          KI5     002562          L1021   070570          L132    013046
FCMD10  047550          IISTOF  061174          KI6     002564          L1022   070576          L133    013046
FCMD11  047734          IISTVE  002742          KI7     002566          L1023   070624          L134    013160
FCMD12  050330          IITRAP  036764          KMAP  = 104422          L1024   070640          L135    013174
FCMD13  050356          INCBNK  042772          KPFLAG  002122          L1025   070654          L136    013254
FCMD14  050400          INCMAR  043006          KSTACK  002706          L1026   070670          L137    013226
FCMD15  050420          INCPAT  042746          LAST  = 157776          L1027   071072          L14     005470
FCMD16  050436          INCRPT  042746          LASTB   002262          L103    011416          L140    013620
FCMD17  050454          INTERL  002264          LASTER  002020          L1030   071072          L141    013472
FCMD18  050470          INTER0  006756          LBLS0 = 001057          L1031   071056          L142    013472
FCMD19  050502          INTER1  006760          LBLS1 = 001055          L1032   071122          L143    013472
FCMD20  050566          INTER2  006760          LBLS10= 000223          L1033   071200          L144    013416
FIELDS  043774          INTER3  006766          LBLS11= 000034          L1034   071230          L145    013434
FINDBA= 000061          INTER4  006766          LBLS2 = 001050          L1035   071260          L146    013452
FIRST = 060000          INTER5  006774          LBLS3 = 001051          L1036   071302          L147    013470
FIRSTB  002260          INTER6  006766          LBLS4 = 001032          L1037   071332          L15     005510
FIRSTP= 000010          INTER7  006774          LBLS5 = 000712          L104    011532          L150    013604
FLIPLO  002734          INTKRA  017610          LBLS6 = 000714          L1040   071362          L151    013534
FLIPWA  035214          INT..0  020234          LBLS7 = 000033          L1041   071646          L152    013542
FLUSH   014656          INT..1  020260          LCSROU= 000055          L1042   072046          L153    013604
FSCMD0  044170          INT..2  020324          LCSRRE= 000114          L1043   072052          L154    013702
FSCMD1  044256          INT..3  020350          LCSRSA= 000112          L1044   072132          L155    013656
FSCMD2  044346          INT..4  020414          LF    = 000012          L1045   072136          L156    013702
FSCMD3  044520          INT..5  020440          LKS   = 177546          L1046   072316          L157    014032
FSCMD4  044764          INT..6  020504          LOADBA  002532          L1047   072264          L16     005570
FSCMD5  045274          INT..7  020530          LOADCS= 104425          L105    011574          L160    014112
FSCMD6  046152          INT.10  020574          LOADER= 000057          L1050   072316          L161    014116
FSCMD7  046160          INT.11  020574          LOADHO  002710          L1051   072316          L162    014336
FSCMD8  046510          INT.12  020616          LOADRS= 177740          L1052   073034          L163    014254
FSCMD9  047104          INT.13  020642          LOCK    002670          L1053   073452          L164    014172
FSINFL  002542          INT.14  020706          LOOP    014342          L1054   073540          L165    014174
FSPAT   045752          INT.15  020732          LOWMAP  042026          L1055   073464          L166    014234
FSSTAC  002374          INT.16  020776          LWDBE = 000053          L1056   073600          L167    014250
FS1     044052          INT.17  021022          LWSBE = 000051          L1057   073602          L17     005654
FS7FLA  002546          INVALI= 104511          L0      004426          L106    011614          L170    014304
GBLENG= 000076          IOTVEC= 000020          L1      004422          L107    011634          L171    014306
GDSWIT  002476          ISECCO  017300          L10     005376          L11     005376          L172    014336
GETDAT  055030          J       002604          L100    011552          L110    011654          L173    014456
GETDA1  055156          KAMIKA  002010          L1000   067226          L111    011672          L174    014566
GETDIS  066514          KAMITE  026006          L1001   067240          L112    011714          L175    014546
GETSIZ  017736          KDIAG = 000010          L1002   067276          L113    011766          L176    014546
GOOD    002050          KDPAR0= 172360          L1003   067306          L114    012034          L177    014622
GOOD2   002052          KDPAR7= 172376          L1004   067630          L115    012130          L2      004536
GOOD3   002054          KDPDR7= 172336          L1005   070316          L116    012250          L20     005616
GTSWR = 104407          KERNEL= 104417          L1006   070234          L117    012372          L200    014622
HEADER  002724          KERSTK= 002000          L1007   070234          L12     005370          L201    014656
HIACBA  002514          KIPAR0= 172340          L101    011416          L120    012422          L202    014734
HIADRS= 177742          KIPAR4= 172350          L1010   070274          L121    012416          L203    014744
HIBANK  002512          KIPAR5= 172352          L1011   070262          L122    012420          L204    015100
HIPAT   042762          KIPAR6= 172354          L1012   070270          L123    012514          L205    015166
HT    = 000011          KIPAR7= 172356          L1013   070360          L124    012474          L206    015306
HUNGMS  002572          KIPDR0= 172300          L1014   070366          L125    012474          L207    015422
HUNGTI  002574          KI0     002550          L1015   070452          L126    012550          L21     005634
!       002602          KI1     002552          L1016   070460          L127    012700          L210    015560
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L211	015716	L274	022600	L356	025152	L44	007700	L521	045714
L212	016054	L275	022614	L357	025224	L440	040210	L522	045716
L213	016234	L276	022624	L36	006630	L441	040252	L523	046232
L214	016372	L277	022624	L360	025350	L442	040260	L524	046234
L215	016552	L3	005046	L361	025540	L443	040376	L525	046442
L216	016674	L30	006242	L362	025756	L444	040432	L526	046602
L217	017230	L300	022662	L363	025770	L445	040462	L527	046604
L22	005636	L301	022672	L364	026030	L446	041114	L53	010202
L220	017152	L302	022672	L365	026036	L447	041144	L530	046630
L221	017034	L303	022732	L366	026042	L45	007714	L531	046644
L222	017152	L304	022746	L367	033434	L450	041246	L532	046646
L223	017134	L305	022756	L37	006712	L451	041276	L533	046772
L224	01721.	L306	022756	L370	033444	L452	041410	L534	047154
L225	017366	L307	023010	L371	033556	L453	041410	L535	047156
L226	017372	L31	006356	L372	033506	L454	041410	L536	047272
L227	017724	L310	023024	L373	033520	L455	041410	L537	047274
L23	005714	L311	023034	L374	033536	L456	041410	L54	010300
L230	020016	L312	023034	L375	033544	L457	041436	L540	047320
L231	020030	L313	023066	L376	033570	L46	010226	L541	047720
L232	020072	L314	023102	L377	033726	L460	041534	L542	047704
L233	020110	L315	023112	L4	005144	L461	042550	L543	047654
L234	020224	L316	023112	L40	006734	L462	042720	L544	050026
L235	020306	L317	023172	L400	033626	L463	043026	L545	050030
L236	020314	L32	006406	L401	033640	L464	043114	L546	050054
L237	020376	L320	023202	L402	033672	L465	043134	L547	050070
L24	005774	L321	023202	L403	033656	L466	043230	L55	010304
L240	020404	L322	023300	L404	033670	L467	043232	L550	050072
L241	020466	L323	023270	L405	033714	L47	010226	L551	050216
L242	020474	L324	023400	L406	033702	L470	043256	L552	050534
L243	020556	L325	023402	L407	033714	L471	043264	L553	050536
L244	020564	L326	023432	L41	007152	L472	043410	L554	050724
L245	020614	L327	023436	L410	034026	L473	043410	L555	050726
L246	020670	L33	006476	L411	035504	L474	043364	L556	051030
L247	020676	L330	023466	L412	036150	L475	043410	L557	050774
L25	006010	L331	023472	L413	036220	L476	043444	L56	010306
L250	020760	L332	023526	L414	036246	L477	043542	L560	051010
L251	020766	L333	023532	L415	036240	L5	005222	L561	051026
L252	021050	L334	023562	L416	036246	L50	010166	L562	051056
L253	021056	L335	023566	L417	037136	L500	043546	L563	051170
L254	021174	L336	023744	L42	007156	L501	043554	L564	051414
L255	021216	L337	023776	L420	037142	L502	043574	L565	051514
L256	021232	L34	006564	L421	037202	L503	043606	L566	051644
L257	021250	L340	024042	L422	037206	L504	044016	L567	051656
L26	006160	L341	024206	L423	037424	L505	044026	L57	010350
L260	021254	L342	024216	L424	037432	L506	044160	L570	052414
L261	021256	L343	024216	L425	037510	L507	044220	L571	052442
L262	021322	L344	024544	L426	037544	L51	010166	L572	052510
L263	021344	L345	024530	L427	037634	L510	044224	L573	052522
L264	021372	L346	024544	L43	007160	L511	044246	L574	053076
L265	021372	L347	024610	L430	037670	L512	044252	L575	053202
L266	021522	L35	006614	L431	037730	L513	045416	L576	053200
L267	021566	L350	024716	L432	037772	L514	045456	L577	053232
L27	006160	L351	024702	L433	040044	L515	045510	L6	005246
L270	022522	L352	024716	L434	040044	L516	045512	L60	010346
L271	022536	L353	025076	L435	040106	L517	045536	L600	053232
L272	022546	L354	025076	L436	040114	L52	010166	L601	053734
L273	022546	L355	025200	L437	040210	L520	045574	L602	053722

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L604    054350      L667    062240      L750    065774      MINDEX  002666      MSG026  113371
L605    054200      L67     011110      L751    066006      MJPAT   021600      MSG027  113403
L606    054272      L670    062040      L752    066030      MJSIZE  002466      MSG028  113420
L607    054314      L671    062066      L753    066076      MJTEST  021512      MSG029  113434
L61     010576      L672    062220      L754    066156      MKCONT  016664      MSG030  113454
L610    054450      L673    062212      L755    066172      MKCSRS  002334      MSG031  113473
L611    054526      L674    062530      L756    066174      MKCSRT  020124      MSG032  113533
L612    054532      L675    062402      L757    066250      MKFLAG  002126      MSG033  113552
L613    054626      L676    062502      L76     011320      MKPAT   021402      MSG034  113571
L614    054642      L677    062756      L760    066316      MKSIZE  002470      MSG035  113707
L615    054646      L7      005316      L761    066312      MKTEST  021222      MSG036  113712
L616    054664      L70     011224      L762    066316      MK11AD= 172100      MSG037  113731
L617    055024      L700    062726      L763    066350      MMR0    = 177572    MSG038  113750
L62     010672      L701    063010      L764    066360      MMR1    = 177574    MSG039  113766
L620    055174      L702    063240      L765    066624      MMR2    = 177576    MSG040  114010
L621    055312      L703    063152      L766    066746      MMR3    = 172516    MSG041  114055
L622    055416      L704    063224      L767    066746      MMTRAP  036740      MSG042  114102
L623    055550      L705    063230      L77     011332      MMVEC   = 000250    MSG043  114123
L624    055724      L706    063272      L770    067116      MOVELO= 000124      MSG044  114150
L625    057152      L707    063306      L771    067050      MP1     012070      MSG045  114175
L626    057136      L71     011236      L772    067074      MP2     012224      MSG046  114231
L627    057152      L710    063562      L773    067076      MP3     012716      MSG047  114264
L63     011076      L711    063562      L774    067116      MP4     012552      MSG048  114303
L630    057314      L712    063454      L775    067300      MP5     012764      MSG049  114343
L631    057202      L713    063450      L776    067164      MRUNSE  053640      MSG050  114375
L632    057216      L714    063454      L777    067276      MSEEDH  002720      MSG051  114503
L633    057232      L715    063662      MAINT   = 177750    MSEEDL  002722      MSG052  114523
L634    057326      L716    063662      MAPH0   = 170202    MSGA34  113625      MSG053  114554
L635    057604      L717    063722      MAPH36= 170372      MSGA87  115753      MSG054  114572
L636    057564      L72     011250      MAPH37= 170376      MSGA98  116242      MSG055  114642
L637    060040      L720    064160      MAPL0   = 170200    MSGB34  113642      MSG056  114663
L64     011076      L721    064104      MAPL1   = 170204    MSG000  111176      MSG057  114716
L640    057724      L722    064150      MAPL36= 170370      MSG001  111254      MSG058  114722
L641    060022      L723    064224      MAPPER  040700      MSG002  111336      MSG059  114766
L642    060174      L724    064230      MARGIN  002112      MSG003  111413      MSG060  115016
L643    060174      L725    064442      MASTER= 000020      MSG004  111520      MSG061  115060
L644    060416      L726    064336      MAST01  057372      MSG005  111626      MSG062  115067
L645    060366      L727    064344      MAST02  060046      MSG006  111640      MSG063  115107
L646    060554      L73     011262      MAST03  060220      MSG007  111675      MSG064  115120
L647    060572      L730    064424      MAST04  061322      MSG008  111707      MSG065  115130
L65     011060      L731    064552      MAST05  061706      MSG009  111721      MSG066  115142
L650    060610      L732    065346      MAST06  062270      MSG010  111733      MSG067  115225
L651    060626      L733    065360      MAST07  062550      MSG011  111745      MSG068  115234
L652    060644      L734    065376      MAST10  062776      MSG012  112033      MSG069  115241
L653    060662      L735    065400      MAST11  063260      MSG013  112130      MSG070  115246
L654    060700      L736    065420      MAST12  063732      MSG014  112132      MSG071  115271
L655    060716      L737    065432      MAST13  064200      MSG015  112134      MSG072  115304
L656    060734      L74     011274      MAST14  064204      MSG016  112136      MSG073  115317
L657    060746      L740    065450      MAST15  064472      MSG017  112150      MSG074  115336
L66     011060      L741    065452      MASWR   002674      MSG018  112161      MSG075  115341
L660    061162      L742    065466      MDISPL  002676      MSG019  112164      MSG076  115373
L661    061162      L743    065676      MEMDON  014410      MSG020  112170      MSG077  115414
L662    061656      L744    065704      MEMERR= 177744      MSG021  112224      MSG078  115430
L663    061456      L745    065732      MEMSIZ= 000004      MSG022  113252      MSG079  115474
L664    061504      L746    065750      MHALT1  004532      MSG023  113274      MSG080  115520
L665    061636      L747    065762      MHALT2  005770      MSG024  113316      MSG081  115560
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MSG082  115577      MTPD03  026630      MT0030  024754      O.CT    075730      O.SVR   100360
MSG084  115617      MTPD21  033354      MT0031  025214      O.CTLC  076162      O.SVTT  100500
MSG085  115661      MTPD25  034412      MT0033  025340      O.CTLE  076242      O.T     075572
MSG086  115706      MTPD26  034666      MT0034  025530      O.CTLF  076210      O.TBIT  077644
MSG087  115745      MTPE25  034434      MT0035  025652      O.C1    100000      O.TBT = 000020
MSG088  115760      MTP000  026376      MT020X  023604      O.DCD   076520      O.TCL2  076442
MSG089  115776      MTP001  026422      MT020Y  023472      O.DCDA  077144      O.TCSR= 177564
MSG090  116020      MTP002  026454      MT020Z  023322      O.DCD1  076550      O.TDB = 177566
MSG091  116034      MTP005  026724      MT0999  025772      O.DCD3  076530      O.TL    101345
MSG092  116046      MTP006  026760      MULHLT  056150      O.DOT   075562      O.TRTC  101370
MSG093  116062      MTP007  027150      MULTIE  060746      O.ERR   076510      O.TVEC= 000014
MSG094  116070      MTP010  027250      MULTIO  002004      O.ERR1  077572      O.TYPE  101126
MSG095  116077      MTP011  027356      MULTIP  003014      O.ERR2  077164      O.TYP1  101004
MSG096  116106      MTP012  027766      MULTIU  056142      O.ERR3  077150      O.UIN   075752
MSG097  116137      MTP013  030344      MUT     002116      O.FIL   075576      O.UPC   075700
MSG098  116234      MTP014  030716      M138AL  054472      O.FTYP  100730      O.URO   075662
MSG099  116245      MTP015  031312      NEMCNT  002072      O.GET   101006      O.USP   075676
MSG100  116256      MTP016  031700      NEWBAN  002400      O.GO    077576      O.UST   075702
MSG101  116305      MTP017  032302      NEWKER  042322      O.GOGO  077624      O.WRD   076760
MSG102  116335      MTP020  032360      NEWLOA  042370      O.GO2   077676      O.WRD1  077036
MSG103  116364      MTP022  033404      NOBALA= 000164      O.ID    101300      O.WST   101202
MSG104  116421      MTP025  034152      NOCLOC  002104      O.IDND= 101315      O.XXX   075564
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MSG106  116527      MTP031  034714      NOERRO  002530      O.LGCH  101321      PAFBAF  015730
MSG107  116545      MTP033  035054      NOFSMO  002526      O.MIN   076502      PAFBAW  016066
MSG108  116622      MTP034  035106      NOIIST  002756      O.MINS  075603      PARBAF  016246
MSG109  116664      MTP20A  032360      NONEM   002102      O.ODT   075774      PARBAW  016404
MSG110  116737      MTP20B  032376      NONEXI  036646      O.OFST  077466      PARCNT  002074
MSG111  117003      MTP20C  032430      NOPAR   002100      O.OLD   077154      PARITY  036454
MSG112  117035      MTP20D  032462      NOSCOP  002540      O.OP1   077160      PARTHE  002372
MSG113  117103      MTP20E  032514      NOTAB   002464      O.OP2   077220      PARVEC= 000114
MSG114  117113      MTP20F  032546      NULLFL  002436      O.OP2A  077226      PASFLG  002362
MSG115  117123      MTV020  023320      OLDCAC  002370      O.ORAB  076364      PATERR  002076
MSG116  117133      MT0000  021704      OLDMAR  002376      O.ORPC  076342      PATPLU  005472
MST11A  063602      MT0001  021740      ONCE    002732      O.ORRB  076374      PATTER  002120
MTA030  024760      MT0002  022000      ONES    002726      O.P     075573      PCBUMP  002406
MTEST   016564      MT0003  022050      O.ADR1  075706      O.PRI   075704      PCONFI  035402
MTPA03  026506      MT0004  022216      O.BACK  077302      O.PROC  077732      PCONFS  035662
MTPA04  026650      MT0005  022300      O.BD    101366      O.PR1   077764      PCONF1  035572
MTPA20  032572      MT0006  022360      O.BIAS  075604      O.RALL  077430      PCONF2  035630
MTPA21  033234      MT0007  022414      O.BKP = 000016      O.RCSR= 177560      PDP110  036752
MTPA24  034060      MT0010  022456      O.BKPT  077324      O.RDB = 177562      PENDBO  002330
MTPA25  034464      MT0011  022512      O.BK1   100060      O.REGT  076270      PERA05  064732
MTPA26  034576      MT0012  022570      O.BRK   100042      O.REM   100602      PERBNK  065564
MTPA32  034772      MT0013  022646      O.BW    075566      O.RORA  101272      PERECC  065650
MTPB03  026550      MT0014  022722      O.BYT   076772      O.RRST  101172      PERRAB  065402
MTPB04  026704      MT0015  023000      O.CAD   075560      O.RSB   100450      PERRAW  065330
MTPB21  033264      MT0016  023056      O.CADV  100634      O.RSR   100416      PERRA3  054652
MTPB24  034120      MT0017  023134      O.CLGT= 000024      O.RSTT  100534      PERRA7  065454
MTPB25  034504      MT0020  023156      O.CLSE  101214      O.S     075571      PERR01= 104427
MTPB26  034612      MT0021  023612      O.CMFD  075600      O.SCAN  076554      PERR02= 104430
MTPB32  035020      MT0022  023734      O.CR    101316      O.SCRN  075602      PERR03= 104431
MTPC03  026610      MT0023  023766      O.CRET  077140      O.SEMI  076742      PERR04= 104432
MTPC21  033320      MT0024  024032      O.CRLF  101246      O.SEQ   075570      PERR05  064726
MTPC24  034134      MT0025  024172      O.CRLS  101254      O.SMFD  075601      PERR06  064754
MTPC25  034536      MT0026  024240      O.CSR1  075574      O.SNGL  076446      PERR07= 104433
MTPC26  034646      MT0027  024370      O.CSR2  075575      O.STM = 000340      PERR10= 104434
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PHYADD  002044
PORTCO  002646
PORTDI  002606
PROTEC= 000002
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PTYFLA  002626
PWLOCK  002760
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QUE     072154
QUE1    072222
QUICK   002536
QVFLAG  002440
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RDCHR = 104411
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REFRES  033760
REFSUB  034030
REGCOP  035204
RELOCA  041130
RELOC1  041456
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RESTAR  002752
RESVEC= 000010
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SAVREG= 104415
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SBEFLA  002022
SBEMSK  002350
SBETES  017374
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SDPDR7= 172236
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SEEDLO  002716
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SETPAT  042762
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SIDE    002422
SIDEOK  021066
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SIZELO= 177760
SKIPKA  002012
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SLAVEN  075774
SLAVER  002570
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SLAVE3= 000200
SLAVUP  061216
SLFLAG  002656
SLPAT   051570
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SLPAT1  051534
SLPAT2  051542
SLPAT3  051550
SLPAT4  051556
SLPAT5  051564
SOBK    002704
SOBLEN= 000056
SOFTPA  002744
SOURCE  002402
SPECIA  002432
SSP   =%000006
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START1  000300
START2  000310
START3  000200
START4  000322
STOPCP  011720
STOPOK  002520
STRIPE  002460
STRTDI  002364
SUBAAA  005532
SUBAAB  005200
SUBAAQ  007720
SUBAAR  013160
SUBAAS  007002
SUBAAT  011334
SUBAAU  014602
SUCCES  002424
SUPDOA  002360
SUPDO1  026042
SUPDO2  026056
SUPDO3  026220
SUPDO4  026234
SUPDR0  002266
SUPDR1  002270
SUPDR2  002272
SUPDR3  002274
SUPDR4  002276
SUPDR5  002300
SUPDR6  002302
SUPLIM  057372
SUPM13  053752
SUPSTK= 000740
SWAPAT  002764
SWR     002766
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SW11  = 004000
SW12  = 010000
SW13  = 020000
SW14  = 040000
SW15  = 100000
SW2   = 000004
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SW7   = 000200
SW8   = 000400
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TAG71$  067646
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TAG76$  067754
TAG77$  067776
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TAG81$  070100
TAG82$  070122
TAG83$  070324
TAG84$  070410
TAG85$  070502
TAG86$  070612
TAG9$   007232
TASK    002616
TASKDO  050726
TASKRE  050710
TASK00  051234
TASK01  051236
TASK02  051330
TASK03  051430
TASK04  051664
TASK05  051774
TASK06  052300
TASK07  052326
TASK10  052336
TASK11  052536
TASK12  052644
TASK13  052726
TASK14  053276
TASK15  053310
TASK16  053316
TASK17  053334
TASK20  053422
TASK7A  052344
TBG4$   026314
TCFIG1  036012
TCONFI  035664
TEMP    002534
TESTAD  002506
TIME    002434
TIMEOU  036726
TKVEC = 000060
TMFLAG  002140
TOOMAN  002472
TRAPVE= 000034
TRT   = 000003
TSK05A  052240
TSK13A  053100
TSK13B  053136
TSK20A  053602
TSTBAN  007606
TSTDAT  002344
TSTRD1  037434
TSTREA= 104510
TST1    006260
TST2    007004
TST3    007160
TST4    010310
TST5    014342
TST6    014414
TST7    014456
TWOCSR  002600
TYPDS = 104405
TYPEIT= 104401
TYPOC = 104402
TYPOS = 104403
TYPS0 = 000000
TYPS1 = 000000
TYPS10= 000000
TYPS11= 000002
TYPS2 = 000000
TYPS3 = 000000
TYPS4 = 000000
TYPS5 = 000000
TYPS6 = 000000
TYPS7 = 000002
T12A    031700
T12B    031722
UDPAR0= 177660
UDPAR1= 177662
UDPAR7= 177676
UDPDR7= 177636
UIPAR0= 177640
UIPAR2= 177644
UIPAR3= 177646
UIPAR4= 177650
UIPAR5= 177652
UIPAR6= 177654
UIPAR7= 177656
UIPDR0= 177600
UNITOP  002516
UNRELO  041604
UPPFLG  002363
UP2     056154
USERMA  042240
USESTK= 000700
USP   =%000006
WAITST  012034
WAIT5   063674
WAKEUP  054544
WARN1   007320
WARN2   026522
WARN3   026536
WARN4   026562
WARN5   026576
WARN6   035364
WARN7   024416
WASDBE= 104500
WASSBE= 104476
WAS1DB= 104501
WAS1SB= 104477
WHICHC  050630
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CEMKAB0 1170 MAIN MEMORY DIAG 2 MACRO M1113 01-AUG-79 07:12 PAGE 568-10
SYMBOL TABLE SEQ 0560

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WHODUN= 000202          $DEENE  037040          $KMAP   041016          $PER03  064650          $SWREG  075156
WOOPEN  056512          $DEVCT  075144          $K$    = 000204          $PER04  064700          $T     = 001060
WOOPS   056160          $DEVM   075212          $L     = 000212          $PER07  064762          $TESTN  075140
WOOPSA  056542          $DIDDO= 000000          $LF     003011          $PER10  065004          $TKB    002774
WOOPUP  056336          $DOAGA  015040          $LL    = 000210          $PER11  065034          $TKS    002772
WORST   002712          $DOAGN  015010          $LOADC  037076          $PER12  065054          $TN    = 000010
WRITEO  002502          $DOWN   055532          $LOAD1  037146          $PER13  065076          $TPB    003000
XXDPCH  002446          $DTBL   073002          $LPADR  002746          $PER14  065116          $TPFLG  002452
ZERO    002426          $ECCDI  037466          $LPERR  002750          $PER15  065140          $TPS    002776
ZEROS   002430          $ECCIN  037554          $L$    = 000000          $PER16  065162          $TRAP   075252
$APTHD  075236          $ECC1D  037522          $MADR1  075166          $PER17  065202          $TRAP2  075274
$AUTO   002066          $ECC1I  037574          $MADR2  075172          $PER20  065220          $TRPAD  075314
$BANK   002015          $ENASB  037612          $MADR3  075176          $PER21  065236          $TSTM   075242
$BASE   075210          $ENA1S  037646          $MADR4  075202          $PER22  065256          $TSTRD  037310
$BELL   003003          $ENDAD  015000          $MAIL   075134          $PER23  065274          $TTYIN  074200
$CACHF  037066          $ENERG  037030          $MAMS1  075164          $PER24  065312          $TYPDS  072576
$CACHN  037050          $ENV    075154          $MAMS2  075170          $PER25  054570          $TYPE   056752
$CBCSR  037700          $ENVM   075155          $MAMS3  075174          $PER26  065502          $TYPEC  057076
$CB1CS  037742          $EOP    014662          $MAMS4  075200          $PER27  065522          $TYPEX  057360
$CDW1   075214          $ERFLG  002016          $MBADR  075240          $PER30  054762          $TYPOC  072374
$CDW2   075216          $ERROR  066662          $MNEW   074254          $PER31  065720          $TYPON  072410
$CHARC  057356          $ERRTB  101372          $MSGAD  075150          $PER32  066016          $TYPOS  072350
$CHKDI  040354          $ERRTY  067324          $MSGLG  075152          $PER33  066064          $T1    = 000000
$CHK1D  040410          $ERTTL  002754          $MSGTY  075134          $PER34  066144          $T2    = 001057
$CKSWR  073022          $ESCAP  002454          $MSWR   074243          $PER35  066176          $UNIT   075146
$CLRCS  040322          $ETABL  075154          $MTYP1  075165          $PWRDN  055160          $UNITM  075246
$CLR1C  040340          $ETEND  075236          $MTYP2  075171          $PWRUP  055536          $USWR   075160
$CMTAG  002000          $EXHAL  043546          $MTYP3  075175          $QUES   003007          $VECT1  075204
$CMTGE  002700          $ES    - 000001          $MTYP4  075201          $R     = 177777          $VECT2  075206
$CNTLC  074224          $FATAL  075136          $NOTRA  075306          $RAND   074720          $WASDB  040146
$CNTLG  074236          $FILLC  003002          $NULL   002450          $RDCHR  073602          $WASSB  040002
$CNTLU  074231          $FILLS  002451          $NWTST= 000001          $RDDEC  074436          $WAS1D  040262
$CPUOP  075162          $FS    = 000000          $OCNT   072572          $RDLIN  073722          $WAS1S  040116
$CRLF   003010          $GTSWR  073160          $OCTVL  075116          $RDOCT  074266          $XTSTR  066370
$DBLK   073012          $HALT   067136          $OCT8  = 075122          $READC  037220          $Y$    = 000000
$DB20   075014          $HALT2  075312          $OMODE  072574          $RESRE  074662          $ZAP42  014760
$DDW0   075220          $HIBTS  075236          $OVER   066502          $SAVRE  074624          $Z$    = 000000
$DDW1   075222          $HIOCT  074434          $O$    = 000000          $SAVR6  056140          $$S    = 000000
$DDW2   075224          $ILLUP  056134          $PASS   075142          $SCOPE  066232          $$T     001040
$DDW3   075226          $INVAL  040510          $PASTM  075244          $STN   = 000001          $$TT    001042
$DDW4   075230          $ITEMB  002017          $PATMA  002014          $SVLAD  066466          $OFILL  072573
$DDW5   075232          $I$    - 000001          $PER01  064574          $SV$   - 000000

. ABS.  117144      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  30712 WORDS  ( 120 PAGES)
DYNAMIC MEMORY:  21560 WORDS  ( 82 PAGES)
ELAPSED TIME:  01:51:14
CEMKAB.BIC,CEMKAB.LS1/CRF:SYM/-SP CEMKAB.MLB/ML,CEMKAB.MA1,CEMKAB.MA2
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CEMKAB CREATED BY MACRO ON 1-AUG-79 AT 07:46 PAGE 1
SYMBOL CROSS REFERENCE CREF V01 SEQ 056

SYMBOL	VALUE	REFERENCES								
ABORTF	002142	#38-1166	*281-6181	393-570	595-607	*395-625	448-1990	448-1993	448-2002	448-2005
ACFLAG	002124	#38-1159	71-2036	75-2113	*77-2125	77-2126	81-2210	94-2576	94-2590	102-2754
		109-2847	111-2863	113-2897	115-2931	117-2972	120-3018	122-3060	124-3109	126-3151
		131-3240	169-4136	169-4159	171-4190	313-6654	*324-6878	*324-6889	351-7479	353-7533
		357-7682	389-466	412-1076	420-1252	423-1317	425-1377	427-1425	429-1467	433-1534
		437-1623	439-1684							
ACK	002672	#40-1308	*45-1404	45-1410	*89-2385	90-2424	90-2431	*90-2440	*90-2479	
ACTFLA	002442	#38-1239	*52-1534	65-1826	69-2022	149-3655	149-3668	158-3888	158-3897	158-3905
		158-3915	160-3926	160-3935	162-3950	162-3989	162-3995	162-4002	162-4008	165-4091
		179-4326	335-7055	460-2263						
ADDPAR	014570	102-2751	#102-2768							
ADDRES	002040	#38-1134	*65-1820	*79-2174	*206-4742	*206-4756	*209-4814	*209-4828	*212-4901	*283-6213
		*385-408	*385-416	*393-569	*393-569	*393-591	*395-606	*395-606	395-609	395-619
		*445-1883	*445-1884	*445-1889	*445-1890	*445-1895	*445-1896	*445-1901	*445-1902	*445-1909
		*445-1917	*445-1922	*445-1922	*445-1927	*445-1932	*447-1938	*447-1943	*447-1948	*447-1953
		*447-1958	*447-1963	*447-1968	*447-1973	*447-1978	*447-1983	*452-2053	*454-2083	*454-2092
		468-2434	477-2631	477-2633	477-2633	477-2635	477-2635	477-2638	477-2640	477-2640
		477-2642	477-2642	560-4700	560-4703	560-4706	560-4708	560-4713	560-4721	
ADD..0	071152	#475-2604	#477-2629							
ADD..1	071162	475-2605	#477-2631							
ADD..2	071202	475-2606	#477-2633							
ADD..3	071232	475-2607	#477-2635							
ADD..4	071262	475-2608	#477-2637							
ADD..5	071264	475-2609	#477-2638							
ADD..6	071304	475-2610	#477-2640							
ADD..7	071334	475-2611	#477-2642							
ALLCPU	002510	#38-1261	*90-2496	94-2572	389-463	*414-1113	*414-1115	*414-1116	420-1249	423-1314
		425-1374	427-1422	429-1464	433-1529	437-1620	439-1681			
APTCOR	002522	#38-1266	*98-2686	98-2694	560-4705					
APTDOW	043640	52-1529	#335-7085	335-7088	*335-7090					
APTFLA	002444	#38-1240	*52-1528	54-1547	98-2665	158-3888	158-3897	158-3905	158-3915	160-3926
		160-3935	162-3950	165-4091	179-4326	335-7055	460-2263			
APTHAN	015050	92-2558	#107-2832	107-2838						
APTHLT	043706	#335-7092								
APTMOS	002524	#38-1267	*98-2689	98-2694	560-4705					
APTSIZ	002544	#38-1275	*52-1524	98-2665						
BACKGN	035344	154-3840	154-3851	156-3870	164-4025	165-4070	#270-5940	331-7015		
BAD	002056	#38-1140	*79-2176	*90-2447	*90-2484	*98-2703	*385-407	*385-415	*389-484	*389-530
		*393-572	*393-594	*395-609	*395-623	*408-975	*408-1018	*410-1050	*412-1084	*412-1098
		*420-1267	*420-1289	*423-1331	*423-1353	*425-1403	*427-1444	*429-1480	*435-1591	*435-1605
		*437-1638	*439-1703	*441-1728	*445-1885	*445-1891	*445-1898	*445-1903	*445-1908	*445-1918
		*445-1923	*445-1928	*445-1933	*447-1939	*447-1944	*447-1949	*447-1954	*447-1959	*447-1964
		*447-1969	*447-1974	*447-1979	*447-1984	450-2031	*452-2054	*454-2084	*454-2093	*454-2094
		*454-2113	474-2567	474-2570	474-2573	474-2576	560-4700	560-4706	560-4708	560-4716
		560-4720	560-4721	560-4723	560-4725					
BADCSR	002000	#38-1115	470-2475	*475-2597	*475-2598					
BADPC	002026	#38-1129	*283-6240	393-583	448-1991	448-2003	450-2014	452-2064	454-2082	454-2091
		454-2102	459-2234	459-2235	*459-2239					
BADPSW	002036	#38-1133	*283-6241	454-2113	459-2238					
BADSP	002032	#38-1131	*283-6238	*283-6239	459-2237					
BADSTA	036770	281-6182	281-6196	283-6223	283-6227	283-6230	#283-6237	393-583	445-1911	448-1991
		448-2003	450-2014	452-2064	454-2082	454-2091	454-2102	454-2112		

CEMKAB CREATED BY MACRO ON 1-AUG-79 AT 07:46 PAGE 2
SYMBOL CROSS REFERENCE CREF V01 SEQ 0562

SYMBOL	VALUE	REFERENCES								
BADXOR	002064	#38-1143	*450-2031	*450-2032	560-4706					
BAD2	002060	#38-1141	*393-595	560-4716						
BAD3	002062	#38-1142	*393-597	*393-598	560-4716					
BAFPAF	015204	99-2716	#111-2859	111-2888						
BAFPAR	015320	99-2717	#113-2893	113-2922						
BAKPAT	002762	#42-1342	*47-1451	164-4024	165-4069					
BANK	002106	#38-1152	*67-1842	*67-1849	67-1850	67-1852	67-1858	*67-1873	*69-1961	69-1962
		69-1967	*69-2018	69-2018	*69-2020	*71-2034	*71-2042	71-2042	*75-2111	*75-2116
		75-2116	75-2118	*77-2124	77-2126	*77-2127	77-2131	*81-2208	*81-2215	81-2215
		*81-2216	81-2219	*94-2564	*94-2622	94-2622	*102-2752	*102-2761	102-2761	*109-2845
		*109-2853	109-2853	*111-2860	*113-2894	*115-2928	*117-2969	*120-3013	*122-3055	*124-3104
		*126-3146	131-3228	*131-3238	131-3241	*131-3264	131-3264	*131-3279	*169-4134	169-4138
		*169-4150	169-4150	*169-4157	169-4160	*169-4173	169-4173	*171-4187	*171-4196	171-4196
		*171-4206	173-4224	175-4244	177-4282	177-4303	182-4335	185-4369	302-6520	*313-6652
		313-6655	*313-6665	313-6665	317-6725	*317-6726	*317-6730	*317-6734	324-6880	*327-6943
		327-6944	344-7232	*344-7237	*344-7241	344-7244	344-7250	*344-7265	346-7271	*346-7276
		*346-7280	346-7283	346-7289	*346-7317	348-7323	*348-7329	348-7330	348-7332	348-7360
		*348-7435	348-7436	351-7448	*351-7477	351-7481	*351-7488	351-7488	*351-7491	353-7497
		*353-7531	*353-7537	353-7537	*353-7544	353-7545	355-7551	*355-7561	*355-7565	355-7568
		355-7587	*355-7613	355-7614	355-7619	*355-7624	355-7625	355-7633	*355-7639	355-7639
		*355-7641	357-7646	*357-7680	*357-7686	357-7686	*357-7693	357-7694	367-68	367-83
		*367-83	369-103	*369-103	371-147	*371-147	373-166	*373-166	373-168	375-234
		*375-234	377-265	*377-265	379-305	*379-305	379-308	381-351	383-372	*383-372
		383-374	385-388	*385-388	385-390	387-435	*389-462	389-467	389-477	*389-518
		389-518	403-796	*403-797	403-798	*403-816	405-833	*405-834	405-835	*405-848
		407-930	*412-1074	*412-1097	412-1097	*414-1167	*414-1171	414-1171	*414-1174	*420-1248
		*420-1299	420-1299	*423-1313	*423-1363	423-1363	*425-1373	*425-1412	425-1412	*427-1421
		*427-1453	427-1453	*429-1463	*429-1501	429-1501	*433-1528	*433-1571	433-1571	*437-1619
		*437-1658	437-1658	*439-1680	*439-1711	439-1711	452-2040	457-2177	466-2382	466-2406
		468-2436	475-2599	475-2599	489-3021					
BANKIN	002110	#38-1153	*64-1741	64-1742	*64-1762	*67-1854	67-1902	*69-1964	69-2007	81-2220
		94-2566	313-6660	317-6728	317-6732	*324-6882	412-1092	414-1169	414-1176	433-1532
BANKMO	042072	81-2226	107-2830	313-6658	317-6723	#319-6767	335-7079			
BANKOK	042730	120-3016	122-3058	124-3107	126-3149	#327-6918				
BAWPAF	015434	99-2718	#115-2927	115-2955	115-2963					
BAWPAR	015572	99-2719	#117-2968	117-2996	117-3004					
BDSWIT	002500	#38-1257	*79-2183	560-4708						
BEGIN	005752	45-1414	47-1454	47-1455	#58-1618					
BGTEST	035110	#269-5862	269-5883							
BIT0	= 000001	#11-315	64-1715	64-1735	79-2190	79-2191	281-6170	285-6254	285-6258	285-6263
		285-6268	290-6338	290-6340	293-6367	293-6372	293-6377	293-6383	296-6425	296-6427
		296-6433	296-6436	298-6460	298-6462	298-6473	298-6475	315-6711	315-6713	317-6743
		317-6745	340-7179	344-7246	346-7285	355-7570	359-7723	359-7729	375-221	385-423
		385-429	395-620	395-628	470-2482	474-2548				
BIT1	= 000002	#11-314	79-2191	79-2195	102-2768	133-3295	139-3425	293-6355	293-6361	293-6377
		293-6383	293-6390	293-6397	300-6489	300-6496				
BIT10	= 002000	#11-305	77-2147							
BIT11	= 004000	#11-304	67-1909	67-1928	89-2399	276-6016	313-6673	324-6904	395-621	395-627
		408-1007	416-1202	452-2042						
BIT12	= 010000	#11-303	60-1651	60-1652	60-1658	64-1747	64-1751	69-2008	94-2593	139-3434
		278-6140	313-6678	313-6678	324-6883	481-2717	481-2718	481-2734		
BIT13	= 020000	#11-302	60-1651	60-1658	64-1744	64-1751	69-1966	96-2631	96-2632	139-3435

SYMBOL	VALUE	REFERENCES								
		177-4309	177-4315	278-6118	302-6522	313-6662	313-6676	313-6677	313-6692	317-6733
		317-6737	317-6760	333-7047	361-7770	412-1094	481-2717	481-2734		
BIT14	= 040000	#11-301	36-1089	64-1745	67-1868	67-1881	67-1898	67-1920	69-1966	69-1969
		96-2631	96-2632	135-3332	146-3630	173-4225	175-4251	177-4284	182-4357	185-4391
		250-5564	250-5565	290-6345	290-6347	313-6676	313-6677	315-6699	317-6740	319-6791
		319-6807	324-6910	335-7087	344-7251	346-7291	346-7309	355-7602	361-7756	361-7769
		365-22	365-30	365-59	367-67	367-81	369-101	371-146	371-158	373-165
		373-169	373-190	375-232	377-263	377-280	379-304	379-312	379-333	383-371
		383-375	385-387	385-398	387-441	387-452	389-468	389-496	393-571	393-593
		395-608	395-622	398-670	398-674	401-756	401-760	403-799	405-836	407-925
BIT15	= 100000	#11-300	56-1579	56-1580	56-1603	81-2206	81-2221	83-2274	83-2285	83-2298
		135-3349	135-3361	135-3364	135-3368	162-3979	288-6284	288-6295	290-6337	290-6347
		298-6449	313-6661	313-6673	313-6674	315-6699	315-6706	317-6729	317-6740	319-6791
		319-6807	324-6898	365-60	379-306	398-670	401-760	412-1093	414-1170	414-1177
		416-1189	416-1217	454-2103	457-2190	468-2439	470-2478			
BIT2	= 000004	#11-313	79-2190	79-2192	83-2296	139-3425	281-6185	285-6268	293-6390	293-6397
		300-6489	300-6496	340-7179	359-7723	439-1670	477-2631	477-2633	477-2635	477-2638
		477-2640	477-2642							
BIT3	= 000010	#11-312	64-1752	77-2150	79-2193	79-2194	90-2456	139-3424	139-3428	278-6114
		285-6268	293-6356	293-6362	293-6378	293-6384	293-6391	293-6398	300-6490	300-6497
		340-7179	359-7723	433-1533	439-1670	477-2633	477-2635	477-2640	477-2642	
BIT4	= 000020	#11-311	64-1768	64-1769	79-2192	79-2194	90-2434	90-2468	107-2826	135-3349
		135-3368	290-6337	296-6414	296-6434	410-1038	412-1070	414-1113	414-1116	454-2103
		470-2478								
BIT5	= 000040	#11-310	52-1520	62-1679	79-2195	79-2196	107-2826	315-6702	315-6710	317-6747
		317-6750	333-7038	335-7081						
BIT6	= 000100	#11-309	79-2196	79-2197	273-5960	273-5993	348-7373	348-7430	351-7467	351-7473
		353-7523	353-7542	355-7596	355-7611	357-7672	357-7691	373-177		
BIT7	= 000200	#11-308	52-1523	79-2193	79-2197	273-5959	348-7372	351-7466	353-7522	355-7595
		357-7671	363-7777							
BIT8	= 000400	#11-307	64-1715	64-1746	89-2374	285-6268	340-7179	359-7723	385-423	385-429
BIT9	= 001000	#11-306	146-3647	146-3648	285-6254	285-6258	285-6268	315-6711	315-6713	317-6743
		317-6745	340-7179	359-7723	375-221	470-2482	474-2548			
BLOCK1	043710	67-1846	83-2286	102-2751	152-3786	152-3795	152-3806	154-3826	154-3843	154-3854
		162-3982	162-3987	162-3993	162-4000	162-4006	162-4012	164-4031	164-4034	164-4038
		164-4041	165-4077	167-4110	167-4115	169-4129	171-4184	175-4258	177-4306	240-5406
		270-5945	290-6323	#337-7102	369-133	375-237	375-243	377-292	377-295	379-302
		385-386								
BLOCK2	043730	#337-7107	373-170							
BLOCK3	043744	154-3822	154-3827	154-3828	154-3844	154-3855	165-4078	165-4079	167-4111	167-4112
		173-4226	177-4285	315-6700	317-6741	319-6792	319-6808	#337-7111	403-802	403-805
BMFLAG	002136	#38-1164	81-2210	115-2933	117-2974	122-3062	126-3153	313-6654	*324-6879	*324-6906
		*324-6909	412-1076							
BOOT	043416	#333-7024	487-2972	490-3092	508-3689					
BOOT1	043460	333-7033	#333-7039							
BRGOBB	035112	#269-5863	269-5867	269-5901						
CACHK	002700	#42-1315	285-6262	340-7179	*359-7723	*359-7729	439-1670	439-1670		
CACHOF	104424	#9-193	65-1810	67-1867	67-1880	67-1897	67-1919	69-1957	75-2083	83-2255
		92-2513	131-3249	135-3333	146-3631	182-4359	185-4393	250-5528	288-6290	290-6314
		290-6332	338-7134	359-7724	365-10	369-141	371-155	373-183	373-187	#375-257
		385-419	407-910	408-951	483-2757					
CACHON	104423	#9-192	47-1475	65-1813	67-1871	67-1884	67-1901	67-1924	69-2028	75-2107

SYMBOL	VALUE	REFERENCES								
		90-2508	92-2530	131-3257	135-3372	135-3379	146-3645	182-4361	185-4395	248-5504
		359-7730	397-645							
CACHVE	= 000114	#11-330	11-331							
CBCSR	= 104474	#9-236								
CB1CSR	= 104475	#9-237	146-3629	206-4716	209-4802	212-4893	217-4966	220-5044	223-5121	260-5709
CHECK	002404	#38-1223	*146-3627	293-6389	293-6396	*305-6551	560-4713			
CHKDIS	= 104504	#9-244	69-1971	69-1980	69-1988	69-1996				
CHKGEN	040540	206-4705	209-4793	212-4882	217-4954	220-5031	223-5109	258-5649	#305-6528	
CHKTAB	040640	305-6538	#307-6556							
CHKTDI	= 104505	#9-245	236-5291	236-5312	236-5320	238-5335	238-5356	238-5365	240-5381	240-5400
		393-585								
CKEND	073316	487-2953	487-2955	487-2957	#487-2986					
CKSWR	= 104410	#9-175	456-2134	459-2214	460-2255	483-2755				
CLRCSR	= 104502	#9-242	69-1974	69-1983	69-1991	69-1999	69-2013	#149-3658	169-4128	171-4199
		#348-7386	#351-7453	#353-7514	#355-7557	#357-7663	369-132	375-254		
CLR1CS	= 104503	#9-243	133-3293	135-3341	135-3359	135-3375	146-3634	146-3643	162-3981	162-4014
		206-4688	206-4733	206-4746	206-4777	209-4785	209-4804	209-4855	212-4862	212-4876
		212-4895	214-4924	217-4948	217-4970	217-5005	220-5025	220-5046	220-5082	223-5125
		225-5162	240-5411	258-5684	393-590					
CMD11A	047774	#357-7649	357-7653	357-7657						
CMD11B	050164	#357-7680	357-7688							
CMD11C	050240	357-7668	#357-7690							
CMD20A	050576	361-7746	#361-7768							
CMD5A	045456	#348-7349	348-7353	348-7357						
CMD5B	045666	#348-7381	348-7394							
CMD5C	046052	348-7365	348-7369	#348-7429						
CMD7A	046336	351-7463	#351-7472							
CMD8A	046550	#353-7500	353-7504	353-7508						
CMD8B	046740	#353-7531	353-7539							
CMD8C	047014	353-7519	#353-7541							
CMD9A	047240	#355-7573	355-7577	355-7581						
CMD9B	047456	355-7586	#355-7607							
CMD9C	047464	355-7592	#355-7610							
CMD9LO	047444	355-7585	#355-7603	355-7605	355-7607					
CONFGE	002576	#38-1288	*67-1910	*67-1929	94-2576	*94-2577	94-2617	*94-2618	96-2659	
CONFGT	006666	64-1705	#64-1767							
CONFG1	006304	#64-1707	64-1773							
CONFG3	006520	#64-1742	64-1765							
CONFG5	006712	64-1736	64-1766	#64-1772						
CONFIE	004336	#44-1398	50-1486							
CONFIG	003016	#44-1395	50-1484	*56-1579	*56-1580	*64-1743	*64-1744	*64-1745	*64-1747	*64-1752
		*64-1756	*64-1761	*65-1822	67-1859	*67-1909	*67-1911	*67-1928	*67-1932	69-1965
		69-1966	69-1966	*69-2008	*81-2206	*81-2221	94-2571	94-2579	94-2580	94-2581
		94-2582	94-2591	94-2593	94-2610	96-2630	96-2631	96-2632	96-2632	177-4309
		*177-4315	276-6016	276-6030	278-6051	278-6058	278-6090	278-6096	278-6113	278-6136
		278-6140	*302-6522	*313-6661	*313-6662	313-6673	313-6674	313-6675	313-6676	313-6677
		313-6677	313-6678	313-6678	*313-6692	*317-6729	*317-6733	*317-6737	324-6883	324-6888
		324-6893	324-6898	324-6904	324-6910	348-7334	355-7628	355-7634	*361-7756	*361-7769
		*361-7770	*412-1093	*412-1094	*414-1170	*414-1177	433-1533	*452-2042	*452-2044	*452-2046
		452-2047								
CONFSP	006754	*64-1706	64-1767	#64-1777						
CONTFL	003332	#38-1200	*99-2711	129-3203	*131-3278					

EMKAB CREATED BY MACRO ON 1-AUG-79 AT 07:46 PAGE 5
SYMBOL CROSS REFERENCE CREF V01 SEQ 0565

SYMBOL	VALUE	REFERENCES								
CONTP	073112	#487-2948	*508-3660	510-3708						
CONTRL	177746	#11-338	*45-1426	64-1704	*64-1775	*285-6262	*285-6263	*285-6268	288-6289	*288-6297
		290-6313	*290-6317	290-6331	*290-6334	338-7133	*340-7182	*385-423	*385-429	*395-621
		*395-627	397-644	*401-780	407-909	*407-945	483-2756	*483-2784	560-4714	
CONTS	073544	487-2951	#489-3033							
CONTS1	073052	#487-2938	489-3040							
CONTS2	073546	#489-3035	489-3036	489-3042						
CONTT	073404	479-2679	487-2943	#489-3007						
COREHI	043300	329-6957	329-6971	329-6984	331-7001	#331-7006	348-7367	348-7434		
COUNT	002462	#38-1250	*248-5505	248-5508	*248-5508	*248-5509	248-5510	*248-5517	*250-5526	250-5530
		*250-5530	*250-5531	250-5532	*250-5551					
CPUBIT	002114	#38-1155	45-1407	*50-1490	58-1625	62-1665	62-1682	65-1822	67-1911	67-1932
		69-1965	81-2205	83-2257	83-2261	83-2265	*89-2382	*90-2470	*90-2495	*90-2506
		94-2563	*94-2572	*94-2574	96-2630	310-6640	313-6675	324-6888	348-7334	365-4
		379-309	*389-463	*389-465	397-638	407-921	407-922	407-923	*410-1040	*410-1051
		*410-1060	*412-1072	*412-1085	*414-1112	416-1195	*420-1249	*420-1251	*423-1314	*423-1316
		*425-1374	*425-1376	*427-1422	*427-1424	*429-1464	*429-1466	*433-1529	*433-1531	*437-1620
		*437-1622	*439-1681	*439-1683	456-2135	487-2931				
CPUERR	177766	#11-348	*50-1502	*50-1513	*56-1612	*60-1646	64-1768	*64-1774	*65-1823	*67-1874
		*75-2098	*340-7194	*340-7198	*342-7210	*342-7227	*344-7266	*346-7318	*456-2158	*457-2195
		*460-2277	560-4704	560-4709	560-4714					
CPUID	011656	83-2259	83-2263	83-2267	#83-2271					
CR	000015	#11-271	407-937							
CRLF	000200	#11-272	407-890	564-4782	568-4839	568-4840	568-4841	568-4842	568-4844	568-4846
		568-4847	568-4848	568-4849	568-4850	568-4851	568-4857	568-4861	568-4862	568-4863
		568-4864	568-4865	568-4866	568-4867	568-4868	568-4869	568-4870	568-4871	568-4872
		568-4873	568-4874	568-4875	568-4876	568-4877	568-4878	568-4879	568-4880	568-4881
		568-4882	568-4883	568-4885	568-4886	568-4887	568-4888	568-4889	568-4890	568-4891
		568-4892	568-4893	568-4894	568-4895	568-4896	568-4897	568-4901	568-4903	568-4904
		568-4905	568-4906	568-4907	568-4908	568-4909	568-4910	568-4911	568-4912	568-4913
		568-4913	568-4914	568-4916	568-4917	568-4918	568-4919	568-4920	568-4922	568-4923
		568-4924	568-4926	568-4927	568-4928	568-4932	568-4934	568-4938	568-4939	568-4940
		568-4941	568-4944	568-4945	568-4945	568-4946	568-4947	568-4948	568-4949	568-4950
		568-4952	568-4953	568-4954	568-4955	568-4956	568-4959	568-4960	568-4961	568-4967
		568-4968	568-4969	568-4972	568-4973	568-4974	568-4975	568-4976	568-4976	568-4978
		568-4979	568-4980	568-4981	568-4982	568-4983	568-4984	568-4985		
CSR	002144	#38-1167	64-1712	64-1731	64-1732	64-1751	*69-1968	*69-1979	*69-1987	*69-1995
		*77-2142	*77-2143	*77-2145	*77-2146	*77-2147	*77-2149	*77-2149	*77-2150	77-2153
		*92-2549	*92-2550	133-3295	135-3349	135-3368	137-3396	*139-3424	*139-3425	*139-3428
		139-3429	139-3432	146-3637	149-3672	149-3673	236-5283	236-5284	*236-5290	236-5304
		236-5306	*236-5311	*236-5319	238-5326	*238-5334	238-5348	238-5350	*238-5355	*238-5364
		240-5372	*240-5380	240-5391	240-5393	*240-5399	288-6280	288-6282	288-6291	288-6293
		*290-6309	*290-6310	*290-6315	*290-6316	290-6337	290-6337	*290-6348	*290-6349	*293-6355
		*293-6356	*293-6357	*293-6361	*293-6362	*293-6363	*293-6367	*293-6368	*293-6372	*293-6373
		*293-6377	*293-6378	*293-6379	*293-6383	*293-6384	*293-6385	*293-6389	*293-6390	*293-6391
		*293-6392	*293-6396	*293-6397	*293-6398	*293-6399	296-6414	296-6434	298-6449	298-6468
		298-6470	*300-6480	*300-6480	*300-6484	*300-6484	*300-6489	*300-6490	*300-6491	*300-6496
		*300-6497	*300-6498	*342-7213	*342-7216	393-587	398-685	398-685	*400-739	*400-739
		454-2103	470-2474	470-2474	470-2478	470-2479	470-2482	*470-2495	*470-2495	479-2682
		479-2682	479-2691	479-2693	*479-2699	*479-2699	560-4711	560-4711	560-4712	560-4712
		560-4713	560-4713							
CSRCAS	020114	*31-3255	#142-3448							

SYMBOL	VALUE	REFERENCES								
CSRFB	002214	#38-1171	*64-1733	475-2595						
CSRFBA	002410	#38-1225	131-3264	*137-3392	*144-3505	*144-3521	*144-3537	*144-3553	*144-3581	*144-3597
		*144-3613								
CSRFIR	002336	#38-1207	131-3246	*144-3499	*144-3507	*144-3509	*144-3515	*144-3523	*144-3525	*144-3531
		*144-3539	*144-3541	*144-3547	*144-3555	*144-3557	*144-3575	*144-3583	*144-3585	*144-3591
		*144-3599	*144-3601	*144-3607	*144-3615	*144-3617	146-3628	162-3975	162-3999	236-5285
		348-7323	*348-7382	*348-7433						
CSRINC	002414	#38-1227	131-3261	*144-3501	*144-3511	*144-3517	*144-3527	*144-3533	*144-3543	*144-3549
		*144-3559	*144-3577	*144-3587	*144-3593	*144-3603	*144-3609	*144-3619	*162-3964	162-3977
		236-5286								
CSRIND	002416	#38-1228	*131-3229	131-3232	*131-3274					
CSRLB	002234	#38-1172	*64-1738	475-2596						
CSRLBA	002412	#38-1226	131-3238	*137-3393						
CSRLOO	002420	#38-1230	*131-3231	131-3267	*131-3276	131-3276	133-3297			
CSRNO	002256	#38-1174	*64-1703	64-1729	64-1749	*64-1772	64-1773	*77-2138	*77-2161	77-2161
		*92-2551	*92-2556	92-2556	*133-3292	*162-3958	288-6277	290-6306	290-6325	*296-6410
		*296-6420	296-6420	*298-6445	*298-6455	298-6455	*302-6507	*302-6513	302-6513	338-7133
		*340-7178	351-7448	*351-7491	*363-7779	*363-7791	397-648	*398-681	*398-688	398-688
		*400-736	*400-743	400-743	*401-776	470-2474	*470-2475	*470-2495	475-2588	*475-2625
		479-2682	*479-2687	*479-2697	479-2697	*479-2699	560-4709			
CSROUD	002417	#38-1229	*131-3230	*131-3275	133-3287					
CSROUT	040442	293-6358	293-6369	293-6380	293-6393	300-6481	300-6492	#302-6503		
CSRREL	002254	#38-1173	*60-1640	*60-1645	288-6278	290-6307	290-6326			
CSR0	002154	#38-1169	*64-1731							
CSR2	002174	#38-1170	*64-1732	475-2600						
DATBUF	002340	#38-1208	*198-4553	*198-4554	198-4555	198-4556	198-4558	198-4563	198-4567	*198-4569
		*198-4569	*198-4572	*198-4573	198-4574	198-4575	198-4577	198-4582	198-4586	*198-4588
		*198-4588	*206-4690	*206-4691	206-4696	206-4697	206-4765	*206-4767	*206-4767	*209-4786
		*209-4787	209-4790	209-4791	209-4847	*209-4849	*209-4849	*212-4864	*212-4865	212-4870
		212-4871	*217-4936	*217-4937	217-4942	217-4943	*220-5013	*220-5014	220-5019	220-5020
		*223-5092	*223-5093	223-5098	223-5099	445-1919	445-1924			
DBEMSK	002354	#38-1211	*212-4868	*212-4869	212-4877	212-4879	212-4887	212-4889	214-4906	*214-4908
		*214-4908	*217-4940	*217-4941	217-4949	217-4951	217-4959	217-4961	217-4987	*217-4989
		*217-4989	*220-5017	*220-5018	220-5026	220-5028	220-5036	220-5038	220-5064	*220-5066
		*220-5066	*223-5096	*223-5097	223-5104	223-5106	223-5114	223-5116	225-5144	*225-5146
		*225-5146								
DDISP	177570	#11-265	42-1347	50-1497						
DECMAR	043152	113-2907	117-2984	124-3117	126-3161	#329-6976				
DEENER	104421	#9-188	60-1648	333-7037	335-7080					
DETAIL	071364	464-2360	#477-2645	477-2674						
DETFLA	002326	#38-1196	460-2262	464-2359	*477-2646	477-2647	477-2649	*481-2749		
DETPSW	002324	#38-1195	560-4710							
DETR0	002306	#38-1188	*477-2654	477-2663	560-4710					
DETR1	002310	#38-1189	477-2655	560-4710						
DETR2	002312	#38-1190	560-4710							
DETR3	002314	#38-1191	560-4710							
DETR4	002316	#38-1192	560-4710							
DETR5	002320	#38-1193	560-4710							
DETSP	002322	#38-1194	560-4710							
DF1	102740	#562-4729								
DF10	103076	550-4513	#562-4738							
DF11	103103	548-4421	550-4488	550-4493	550-4498	552-4520	552-4525	552-4540	556-4649	556-4654

SYMBOL	VALUE	REFERENCES								
		#562-4739								
DF12	103114	554-4622	#562-4740							
DF13	103116	552-4555	552-4570	554-4587	556-4634	556-4639	556-4679	#562-4741		
DF14	103125	558-4696	#562-4742							
DF2	102743	548-4426	548-4441	548-4446	548-4451	548-4456	550-4473	550-4503	552-4530	552-4535
		552-4545	552-4550	554-4577	554-4627	556-4644	556-4664	556-4669	556-4674	558-4691
		#562-4730								
DF3	102767	550-4463	552-4565	554-4592	554-4597	554-4607	554-4612	554-4617	556-4684	#562-4731
DF4	103004	550-4468	#562-4732							
DF5	103021	550-4478	550-4508	554-4602	#562-4733					
DF6	103036	550-4483	#562-4734							
DF7	103053	552-4560	#562-4735							
DF8	103067	554-4582	#562-4736							
DF9	103071	548-4431	548-4436	#562-4737						
DH1	107366	548-4424	548-4454	#566-4807						
DH10	110145	550-4471	#566-4818							
DH11	110243	550-4501	552-4533	#566-4819						
DH12	110272	552-4528	#566-4820							
DH13	110307	548-4419	550-4486	550-4491	550-4496	552-4518	552-4523	552-4538	#566-4821	
DH14	110415	552-4543	#566-4823							
DH15	110533	552-4558	#566-4825							
DH16	110655	552-4563	554-4580	556-4682	#566-4827					
DH17	110672	552-4553	552-4568	554-4585	556-4632	556-4637	556-4677	#566-4828		
DH18	110746	556-4647	556-4652	#566-4829						
DH19	111023	554-4620	#566-4830							
DH2	107423	556-4642	#566-4808							
DH20	111037	556-4662	556-4672	#566-4831						
DH21	111056	556-4667	#566-4832							
DH22	111063	558-4689	#566-4833							
DH23	111111	558-4694	#566-4834							
DH3	107446	548-4429	548-4434	#566-4809						
DH4	107502	#566-4810								
DH5	107507	548-4439	548-4444	548-4449	552-4548	#566-4811				
DH6	107615	554-4625	#566-4813							
DH7	107664	550-4461	550-4466	550-4476	550-4481	550-4506	554-4590	554-4595	554-4600	554-4605
		554-4610	554-4615	#566-4814						
DH8	110006	550-4511	#566-4816							
DH9	110106	554-4575	#566-4817							
DIAGFL	002006	#38-1118	*164-4059	*164-4061	248-5522					
DISPLA	002770	#42-1347	*50-1497	*50-1504	355-7604	365-34	375-223	389-461	401-774	408-954
		410-1035	412-1067	414-1180	420-1244	423-1309	425-1372	427-1420	429-1462	431-1524
		437-1618	439-1675	441-1720	457-2192					
DISPRE	= 000174	#13-549	50-1504	*401-775	*457-2193					
DISPTB	014370	99-2714	#99-2716							
DNSLAV	055170	#397-639	397-640							
DOBACK	015104	98-2708	102-2729	104-2781	#109-2843	414-1182				
DSWR	= 177570	#11-264	42-1346	50-1496						
DT1	102252	548-4425	548-4455	#560-4700						
DT10	102444	550-4472	#560-4710							
DT11	102466	550-4502	552-4534	#560-4711						
DT12	102476	552-4529	#560-4712							
DT13	102504	548-4420	550-4487	550-4492	550-4497	552-4519	552-4524	552-4539	#560-4713	

SYMBOL VALUE REFERENCES

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DT14      102530  552-4544  #560-4714
DT16      102556  552-4559  #560-4715
DT17      102610  552-4564   554-4581   556-4683  #560-4717
DT18      102616  552-4569   556-4633   556-4638  #560-4718
DT19      102634  554-4586  #560-4719
DT2       102264  552-4554   556-4678  #560-4701
DT20      102652  556-4643   558-4690  #560-4720
DT21      102662  556-4648   556-4653  #560-4721
DT22      102700  554-4621  #560-4722
DT23      102706  556-4663   556-4673  #560-4723
DT24      102714  556-4668  #560-4724
DT25      102720  558-4695  #560-4725
DT3       102302  548-4430  #560-4702
DT4       102312  548-4435  #560-4703
DT5       102322  548-4440   548-4445   548-4450   552-4549  #560-4704
DT6       102346  554-4626  #560-4705
DT7       102362  550-4462   550-4467   550-4477   550-4482   550-4507   554-4591   554-4596   554-4601   554-4606
                  554-4611   554-4616  #560-4706
DT8       102416  550-4512  #560-4708
DT9       102432  554-4576  #560-4709
DUMMY     002304 #38-1186    560-4701   560-4706   560-4706   560-4707   560-4707   560-4707   560-4707   560-4707
                  560-4707   560-4713   560-4713   560-4715   560-4715   560-4716   560-4716   560-4716   560-4717
                  560-4718   560-4719   560-4721   560-4721   560-4722   560-4725
ECCDIS  = 104470 #9-232       69-2010    149-3656   171-4185   348-7384   351-7451   353-7512   355-7555   357-7661
ECCINT  = 104472 #9-234       65-1795   #65-1829   #69-2025    131-3277   149-3676   171-4202   171-4209   171-4213
                  333-7032   335-7071
ECC1DI  = 104471 #9-233       135-3334   135-3351   146-3640   206-4714   206-4721   206-4774   209-4800   209-4852
                  212-4891   214-4921   217-4964   217-5002   220-5041   220-5078   223-5119   225-5158   240-5409
                  258-5689   260-5697   260-5707
ECC1IN  = 104473 #9-235       135-3371   135-3378   258-5654   260-5700
EMTVEC  - 000030 #11-325     *47-1459   *47-1460
EM1       103134  556-4656  #564-4752
EM10      103633  548-4453  #564-4762
EM11      103677  550-4460   550-4465   550-4475   550-4480  #564-4763
EM12      103721  550-4470  #564-4764
EM13      103745  550-4485  #564-4765
EM14      103777  550-4490  #564-4766
EM15      104043  550-4495  #564-4767
EM16      104111  550-4500  #564-4768
EM17      104137  550-4505  #564-4769
EM18      104177  550-4510  #564-4770
EM19      104256  552-4517  #564-4771
EM2       103220  548-4423  #564-4753
EM20      104333  552-4522  #564-4772
EM21      104415  552-4532  #564-4773
EM22      104454  552-4537  #564-4774
EM23      104501  552-4547  #564-4775
EM24      104530  548-4418  #564-4776
EM25      104607  552-4557  #564-4777
EM26      104634  552-4562  #564-4778
EM27      104705  554-4579  #564-4779
EM28      104774  554-4584  #564-4780
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SYMBOL		VALUE	REFERENCES								
EM29		105027	554-4594	#564-4781							
EM3		103256	548-4428	#564-4754							
EM30		105111	554-4599	#564-4782							
EM31		105230	554-4604	#564-4784							
EM32		105330	554-4609	#564-4785							
EM33		105435	554-4614	#564-4786							
EM34		105543	554-4619	#564-4787							
EM35		105624	554-4589	#564-4788							
EM36		105711	554-4624	#564-4789							
EM37		105760	556-4631	#564-4790							
EM38		106025	552-4552	#564-4791							
EM39		106133	556-4636	#564-4792							
EM4		103311	548-4433	#564-4755							
EM40		106220	556-4641	#564-4793							
EM41		106272	556-4646	#564-4794							
EM42		106374	556-4651	#564-4795							
EM43		106477	556-4661	#564-4796							
EM44		106575	556-4666	#564-4797							
EM45		106672	556-4671	#564-4798							
EM46		106773	556-4676	#564-4799							
EM47		107062	556-4681	#564-4800							
EM48		107170	558-4688	#564-4801							
EM49		107267	558-4693	#564-4802							
EM5		103357	548-4438	#564-4756							
EM6		103434	548-4443	#564-4757							
EM7		103461	548-4448	#564-4758							
EM8		103521	552-4567	#564-4759							
EM9		103556	554-4574	#564-4761							
ENASBE	=	104506	#9-246	65-1827	69-2023						
ENA1SB	=	104507	#9-247	258-5658	258-5691	260-5702					
END		117144	45-1430	#568-4997	568-5007	568-5008					
ENERGI	=	104420	#9-187	62-1686	107-2827	416-1215	418-1236				
ERRMAX		002702	#42-1316	452-2047							
ERROR	-	104000	#11-259	64-1770	65-1817	65-1821	71-2038	79-2184	89-2395	90-2448	90-2485
			92-2521	#94-2583	94-2619	98-2695	98-2704	102-2758	104-2775	209-4815	212-4902
			258-5663	260-5720	260-5731	281-6197	283-6224	283-6228	283-6231	283-6234	298-6472
			340-7193	342-7209	342-7223	365-28	385-409	385-417	389-485	389-511	389-531
			391-550	393-600	408-976	408-1002	408-1019	410-1052	412-1086	412-1099	416-1197
			420-1268	420-1290	423-1332	423-1354	425-1404	427-1445	429-1481	429-1495	435-1592
			435-1606	437-1639	437-1652	439-1704	441-1729	448-1994	#448-1996	448-2006	#448-2008
			450-2017	452-2067	452-2070	452-2073	452-2076	454-2087	454-2098	454-2104	#454-2106
			454-2115	477-2665	477-2671	483-2778					
ERRPC		002024	#38-1128	*459-2228	*459-2229	459-2232	*459-2235	*459-2236	459-2241	462-2295	560-4700
			560-4701	560-4702	560-4703	560-4704	560-4705	560-4706	560-4709	560-4711	560-4713
			560-4715	560-4717	560-4718	560-4719	560-4720	560-4721	560-4722	560-4723	560-4724
			560-4725								
ERRPSW		002034	#38-1132	*459-2231	*459-2238	477-2662					
ERRSP		002030	#38-1130	*459-2230	*459-2237	477-2661					
ERRVEC	=	000004	#11-318	*47-1469	*47-1470	456-2152	*456-2153	*456-2155	*456-2159		
EVEN		002456	#38-1248	*248-5493	248-5494	*250-5557	250-5557				
EXBANK		042422	71-2035	75-2112	77-2128	81-2209	81-2217	94-2565	94-2573	94-258°	102-2753
			109-2846	111-2862	113-2896	115-2930	117-2971	120-3015	122-3057	124-3106	126-3148

SYMBOL	VALUE	REFERENCES								
		131-3239	131-3280	169-4135	169-4158	171-4188	171-4207	313-6653	317-6727	317-6731
		#324-6861	348-7362	348-7437	351-7478	353-7532	353-7546	355-7615	357-7681	357-7695
		389-464	412-1075	414-1168	414-1175	420-1250	423-1315	425-1375	427-1423	429-1465
		433-1530	437-1621	439-1682						
EXCMD3	044726	344-7255	344-7258	344-7262	#344-7264					
EXCMD4	045236	346-7298	346-7302	#346-7316						
EXIT	043522	#335-7053	456-2143	460-2265						
EXIT2	043526	#335-7055								
FASTCI	= 177640	#11-378	67-1869	67-1899	83-2291	154-3824	182-4360	240-5410	290-6328	290-6333
		337-7103	385-399							
FATAL$	002070	#38-1145	*65-1817	*65-1821	*258-5663	*281-6197	*283-6224	*283-6228	*283-6231	*365-28
		460-2263	462-2308							
FCMD10	047550	338-7154	#355-7618							
FCMD11	047734	338-7155	#357-7645							
FCMD12	050330	338-7156	#359-7700							
FCMD13	050356	338-7157	#359-7710							
FCMD14	050400	338-7158	#359-7715							
FCMD15	050420	338-7159	#359-7721							
FCMD16	050436	338-7160	#359-7727							
FCMD17	050454	338-7161	#359-7733							
FCMD18	050470	338-7162	#361-7739							
FCMD19	050502	338-7163	#361-7744							
FCMD20	050566	338-7164	#361-7763							
FIELDS	043774	#338-7124	487-2940	510-3699						
FIRST	= 060000	#13-556	67-1862	67-1891	67-1917	69-1959	69-1970	69-1970	*69-2014	*69-2014
		102-2749	144-3499	144-3507	144-3509	144-3515	144-3523	144-3525	144-3531	144-3539
		144-3541	144-3547	144-3555	144-3557	144-3575	144-3583	144-3585	144-3591	144-3599
		144-3601	144-3607	144-3615	144-3617	152-3783	152-3791	152-3804	154-3815	154-3841
		154-3852	156-3871	164-4030	165-4074	167-4107	169-4139	169-4162	171-4192	173-4226
		173-4231	173-4232	175-4248	175-4264	175-4268	177-4285	177-4288	177-4289	177-4290
		177-4291	177-4299	228-5174	240-5407	248-5506	250-5527	250-5561	250-5563	250-5564
		270-5943	*335-7088	*335-7089	*335-7090	344-7245	346-7284	348-7382	351-7482	355-7569
		365-23	365-31	365-33	365-35	*365-60	367-68	367-82	367-83	367-86
		369-102	369-103	369-106	371-147	371-151	*371-159	373-166	373-170	373-179
		373-181	*373-191	375-233	375-234	375-238	375-246	377-264	377-265	377-281
		377-291	379-305	*379-306	379-310	379-313	379-319	*381-350	*381-352	383-372
		383-376	383-377	385-388	385-391	385-392	385-408	385-416	387-436	*389-469
		389-494	389-514	*391-558	403-800	403-801	403-802	*403-803	*403-804	403-805
		403-807	*405-837	*405-838	405-843	407-926	*407-928	*407-929	425-1381	425-1384
		468-2435								
FIRSTB	002260	#38-1175	64-1733	64-1734	64-1739	*64-1763	64-1764	137-3392	*139-3438	139-3439
		139-3441	*139-3441	144-3505	144-3521	144-3537	144-3553	144-3581	144-3597	144-3613
		*475-2595	475-2599							
FLIPLO	002734	#42-1329	*47-1445	154-3831	*270-5915	*270-5916	270-5917	270-5919	270-5921	
FLIPWA	035214	154-3814	#270-5913							
FLUSH	014656	#104-2784	414-1184							
FSCMD0	044170	#338-7144	#340-7169							
FSCMD1	044256	338-7145	#340-7187							
FSCMD2	044346	338-7146	#342-7202							
FSCMD3	044520	338-7147	#344-7231							
FSCMD4	044764	338-7148	#346-7270							
FSCMD5	045274	338-7149	#348-7322							

SYMBOL	VALUE	REFERENCES								
FSCMD6	046152	338-7150	#348-7440							
FSCMD7	046160	338-7151	#351-7447							
FSCMD8	046510	338-7152	#353-7496							
FSCMD9	047104	338-7153	#355-7550							
FSINFL	002542	#38-1274	*107-2797	144-3568	*144-3569					
FSPAT	045752	348-7392	#348-7396							
FSSTAC	002374	#38-1219	*340-7189	340-7197	*342-7204	342-7226	*348-7325	348-7429	*351-7468	351-7472
		*353-7498	353-7541	*355-7552	355-7610	*357-7647	357-7690			
FS1	044052	#338-7136	338-7142	338-7166						
FS7FLA	002546	#38-1276	169-4152	*351-7449	*351-7490					
GBLENG	= 000076	177-4285	177-4288	#269-5902						
GDSWIT	002476	#38-1256	*79-2179	560-4708						
GETDAT	055030	#395-614	448-1990	448-2002						
GETDA1	055156	*395-616	395-626	#395-631						
GETDIS	066514	182-4336	185-4370	456-2172	#457-2176	459-2217				
GETSIZ	017736	64-1727	137-3391	#139-3421						
GOOD	002050	#38-1137	*64-1769	*79-2175	*98-2702	*385-406	*385-414	*393-576	*393-578	*393-592
		*395-605	*445-1886	*445-1892	*445-1897	*445-1904	*445-1907	*445-1914	*445-1919	*445-1924
		*445-1929	*445-1934	*447-1940	*447-1945	*447-1950	*447-1955	*447-1960	*447-1965	*447-1970
		*447-1975	*447-1980	*447-1985	450-2030	*452-2056	*452-2058	*454-2085	*454-2095	*454-2114
		560-4700	560-4706	560-4708	560-4715	560-4720	560-4721			
GOOD2	002052	#38-1138	*450-2020	*450-2024	560-4715					
GOOD3	002054	#38-1139	*450-2021	*450-2025	560-4715					
GTSWR	- 104407	#9-174	62-1667							
HEADER	002724	#42-1325	*47-1446	*102-2734	*102-2736	*109-2848	*109-2851	*129-3197	*129-3210	*131-3252
		*206-4741	*206-4744	*206-4755	*206-4758	*209-4813	*209-4816	*209-4827	*209-4830	*212-4900
		*212-4903	*260-5721	*260-5732	*348-7380	*353-7529	*357-7678	*452-2061	*452-2078	*454-2086
		*454-2088	*454-2097	*454-2099	*460-2275	462-2306	462-2318	*464-2357	477-2651	*477-2652
		477-2667	*477-2668	*477-2672						
HIACBA	002514	#38-1263	*77-2124	*77-2131	77-2135	77-2143				
HIADRS	= 177742	#11-336	560-4704	560-4714						
HIBANK	002512	#38-1262	*75-2120							
HIPAT	042762	124-3102	126-3144	#327-6937						
HT	= 000011	#11-269	407-887							
HUNGMS	002572	#38-1286	*90-2441	*90-2445	*90-2477	*90-2482	*410-1044	*410-1048		
HUNGTI	002574	#38-1287	*89-2391	*90-2442	*90-2478	*389-481	*389-527	*408-972	*408-999	*408-1015
		*410-1045	*412-1081	*416-1193	*420-1264	*420-1286	*423-1328	*423-1350	*425-1400	*427-1441
		*429-1477	*435-1602	*437-1635	*439-1700	*441-1725	*483-2785			
I	002602	#38-1290	*54-1568	*54-1574	54-1574	*96-2650	*96-2650	96-2651	*96-2651	96-2653
		*131-3250	131-3254	*131-3256	131-3256	*169-4133	169-4143	169-4146	*169-4151	169-4151
		*169-4156	169-4166	169-4169	*169-4174	169-4174	*379-311	*379-318	379-318	*389-495
		*389-513	389-513	*433-1537	433-1539	*433-1568	433-1568	435-1581	435-1589	435-1591
IISTAC	002736	#42-1330	56-1603	56-1604	83-2274	83-2275	83-2295	89-2392	89-2403	90-2418
		365-18	407-915	408-994	408-1000	416-1189	416-1190	416-1194	416-1209	
IISTAD	002740	#42-1331	56-1608	83-2296	89-2399	89-2404	89-2405	90-2419	90-2420	408-995
		408-996	408-1007	416-1191	416-1192	416-1202	416-1210			
IISTIN	061074	83-2293	#416-1187	416-1208						
IISTOF	061174	89-2402	408-993	#416-1207						
IISTVE	002742	#42-1332	89-2386	90-2464	379-303	379-316	381-341	381-342	381-343	381-343
		381-346	381-347	381-347	383-358	391-563	408-985			
IITRAP	036764	47-1473	90-2464	#283-6233						
INCBNK	042772	111-2879	113-2913	115-2949	117-2990	120-3029	122-3073	124-3120	126-3164	#327-6941

SYMBOL		VALUE	REFERENCES								
INCMAR		043006	111-2873	115-2943	120-3026	122-3070	#329-6948				
INCPAT		042746	111-2876	115-2946	#327-6929						
INCRPT		042746	120-3032	122-3076	#327-6928						
INTERL		002264	#38-1177	*64-1726	64-1743						
INTER0		006756	#64-1717	#64-1780							
INTER1		006760	64-1718	#64-1782							
INTER2		006760	64-1719	#64-1783							
INTER3		006766	64-1720	#64-1786							
INTER4		006766	64-1721	#64-1787							
INTER5		006774	64-1722	#64-1791							
INTER6		006766	64-1723	#64-1788							
INTER7		006774	64-1724	#64-1792							
INTKRA		017610	131-3235	#137-3384	162-3962						
INT..0		020234	#137-3400	#144-3499							
INT..1		020260	137-3401	#144-3505	144-3572						
INT..2		020324	137-3402	#144-3515							
INT..3		020350	137-3403	#144-3521							
INT..4		020414	137-3404	#144-3531							
INT..5		020440	137-3405	#144-3537							
INT..6		020504	137-3406	#144-3547							
INT..7		020530	137-3407	#144-3553							
INT.10		020574	137-3408	#144-3564							
INT.11		020574	137-3409	#144-3568							
INT.12		020616	137-3410	#144-3575							
INT.13		020642	137-3411	#144-3581							
INT.14		020706	137-3412	#144-3591							
INT.15		020732	137-3413	#144-3597							
INT.16		020776	137-3414	#144-3607							
INT.17		021022	137-3415	#144-3613							
INVALI	=	104511	#9-249	131-3242	149-3665	151-3731	169-4137	331-7016	346-7290	348-7361	351-7480
			353-7534	355-7588	357-7683	412-1077	420-1253				
IOTVEC	=	000020	#11-323	*47-1457	*47-1458						
ISECCO		017300	131-3233	#133-3284							
J		002604	#38-1291	*433-1538	433-1539	433-1540	433-1543	*433-1549	433-1549		
KAMIKA		002010	#38-1119	179-4326	338-7133	*338-7135	*340-7176	*359-7712	*359-7717		
KAMITE		026006	164-4047	164-4055	165-4065	173-4219	175-4239	177-4277	#179-4325		
KDIAG	=	000010	#248-5492	248-5508	250-5530	250-5556					
KDPAR0	=	172360	#11-469	154-3827	154-3844	154-3855	165-4079	167-4111	191-4478	195-4517	195-4539
			255-5632	263-5739	263-5748						
KDPAR7	=	172376	#11-476								
KDPDR7	=	172336	#11-456								
KERNEL		104417	#9-185	67-1870	67-1883	67-1900	67-1923	69-2015	135-3370	135-3377	146-3644
			173-4227	175-4259	177-4286	182-4362	185-4396	315-6701	317-6742	319-6793	319-6809
			335-7091	344-7253	344-7264	346-7294	346-7312	346-7316	#365-24	365-36	365-61
			367-69	367-84	369-104	371-148	371-160	373-167	373-171	373-192	375-235
			377-266	377-282	379-307	379-320	383-373	383-381	385-389	385-401	387-450
			387-454	389-470	389-515	393-573	393-596	395-610	395-624	398-672	398-676
			401-758	401-762	403-815	405-847	407-931				
KERSTK	-	002000	#11-256								
KIPAR0	-	172340	#11-459	81-2232	310-6605	310-6630	321-6817	321-6837	403-806	405-822	418-1225
KIPAR4	=	172350	#11-463	321-6851							
KIPAR5	-	172352	#11-464								

SYMBOL	VALUE	REFERENCES
KIPAR6	= 172354	#11-465
KIPAR7	= 172356	#11-466
KIPDR0	= 172300	#11-439 310-6632 321-6819 397-661 400-725 400-746 405-823 418-1227
KI0	002550	#38-1277 81-2233 418-1224
KI1	002552	#38-1278
KI2	002554	#38-1279
KI3	002556	#38-1280
KI4	002560	#38-1281
KI5	002562	#38-1282
KI6	002564	#38-1283
KI7	002566	#38-1284
KMAP	= 104422	#9-190 62-1683
KPFLAG	002122	#38-1158 *69-1958 71-2037 81-2211 293-6356 293-6362 293-6378 293-6384 293-6391 293-6398 300-6490 300-6497 *324-6877 *324-6885
KSTACK	002706	#42-1318 45-1406 56-1611 *89-2378 89-2379 *90-2471 *90-2507 107-2825 *367-71 367-73 *408-962 *408-978 *408-990 *408-1004 *408-1021 *408-1028 *412-1105 416-1213 481-2707
LAST	157776	#13-557 131-3261 152-3800 162-3980 164-4028 165-4075 175-4249 175-4263 228-5176 236-5289 248-5507 250-5529 250-5565 265-5805 269-5893 344-7247 346-7286 355-7571 375-244 387-437 425-1384
LASTB	002262	#38-1176 64-1738 64-1764 137-3393 *139-3431 *139-3434 *139-3435 *139-3439 *139-3440 139-3442 *139-3442 *475-2596 475-2599
LASTER	002020	#38-1126 *79-2185 104-2774 *107-2798
LF	- 000012	#11-270 407-941
LKS	- 177546	#11-266 50-1510 *373-177 *373-184
LOADBA	002532	#38-1270 *313-6656 317-6721 317-6726
LOADCS	104425	#9-195 77-2148 77-2151 92-2554 139-3426 293-6364 293-6374 293-6386 293-6400 300-6485 300-6499 302-6510 342-7218 400-740
LOADHO	002710	#42-1319 *81-2219 81-2222 81-2224 107-2828 310-6641 313-6657 317-6722 317-6730 335-7078 414-1174
LOADRS	- 177740	#11-335 281-6176 560-4704 560-4714
LOCK	002670	#40-1307 *45-1436 45-1437 *56-1614 *58-1620 58-1621 *77-2157 *83-2287 *83-2299 *89-2368 *90-2501 90-2502 *335-7082 *408-961 *408-989 *410-1036 *412-1068 *414-1183
LOOP	014342	#99-2710 107-2840
LOWMAP	042026	62-1678 315-6709 317-6749 #317-6754 400-722
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MAPH0	- 170202	#13-484 *62-1677 *315-6708 *317-6748 398-698 *400-721
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MAPH37	= 170376	#13-546
MAPL0	= 170200	#13-483 *62-1677 *315-6706 *317-6748 317-6756 398-698 *400-721
MAPL1	170204	#13-485 317-6757
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MAPPER	040700	62-1685 67-1858 69-1967 69-2019 131-3241 173-4224 175-4244 177-4282 182-4335 185-4369 #310-6604 335-7086 344-7250 346-7289 348-7360 348-7436 353-7545 355-7587 355-7614 357-7694 365-11 365-58 367-75 371-156 373-168 373-188 379-308 381-349 381-351 383-374 385-390 387-435 389-467 389-477 403-798 405-835 407-924 407-930
MARGIN	002112	#38-1154 *111-2869 *115-2939 *120-3022 *122-3066 129-3194 *169-4127 *171-4182 329-6955 *329-6956 329-6959 *329-6960 329-6961 *329-6963 329-6964 329-6967 *329-6970 329-6972

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SYMBOL CROSS REFERENCE CREF V01
SYMBOL VALUE REFERENCES

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                    348-7355  348-7375  *348-7433  351-7448  *351-7491  353-7497  *353-7502  353-7503  353-7503
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                   *355-7613  357-7646  *357-7651  357-7652  357-7652  357-7655  357-7674  *357-7693  *369-131
                   *373-193  *375-253  *383-367  468-2448
MASTER  = 000020    #13-561  45-1407  50-1490  58-1625  62-1665  62-1682  81-2205  89-2380  90-2495
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                    365-4  379-309  389-465  397-638  410-1051  410-1060  412-1085  414-1112  416-1195
                    420-1251  423-1316  425-1376  427-1424  429-1466  433-1531  437-1622  439-1683  456-2135
                    487-2931
MAST01    057372    104-2783  #408-949
MAST02    060046   #410-1032
MAST03    060220   #412-1064
MAST04    061322    414-1118  #420-1241
MAST05    061706    414-1123  #423-1306
MAST06    062270    414-1128  #425-1369
MAST07    062550    414-1133  #427-1417
MAST10    062776    414-1138  #429-1458
MAST11    063260    414-1143  #431-1506
MAST12    063732    414-1148  #437-1615
MAST13    064200    414-1153  #437-1662
MAST14    064204    414-1158  #439-1666
MAST15    064472    414-1163  #441-1717
MASWR     002674   #40-1309  *89-2370  89-2372  90-2494  *408-956  408-958  412-1107
MDISPL    002676   #40-1310  365-33  *365-33  365-34  *375-222  *389-460  389-461  *408-953  408-954
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MEMERR  - 177744   #11-337  281-6170  281-6177  *281-6177  281-6184  *281-6184  281-6190  *281-6190  283-6214
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MHALT2    005770   #58-1622  58-1623
MHALT3    012760   #90-2503  90-2504
MINDEX    002666   #40-1306
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MJSIZE    002466   #38-1252  *96-2627  *96-2631  *96-2637  *96-2638  *96-2639  *96-2640  96-2650  96-2655
                    98-2694  560-4705
MJTEST    021512   129-3208  #151-3724
MKCONT    016664   129-3205  #131-3214  383-362
MKCSRS    002334   #38-1201  *64-1707  *64-1710  *64-1715  64-1746  92-2548  131-3232  162-3956  296-6407
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MKCSRT    020124    54-1550  #142-3454
MKFLAG    002126   #38-1160  71-2036  75-2113  81-2211  94-2569  94-2590  129-3200  171-4189  *324-6877
                  *324-6897  327-6924  329-6964  329-6967  331-6996  331-7007  466-2412  470-2473  475-2582
MKPAT     021402    54-1555  149-3664  149-3664  149-3667  #149-3684
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                    98-2694  560-4705
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MK11AD  = 172100    #13-553  60-1638  288-6276  290-6305  290-6324
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SYMBOL	VALUE	REFERENCES								
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MMR2	177576	#11-354	398-691	*400-731	403-812	*405-829	560-4704	560-4714		
MMR3	172516	#11-355	*62-1671	*62-1679	*107-2826	*315-6702	*315-6710	*317-6747	*317-6750	*333-7038
		*335-7081	398-691	*400-731	403-811	*405-828	560-4704	560-4714		
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MMVEC	- 000250	#11-333	*47-1471	*47-1472						
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MP2	012224	#89-2392	89-2400	90-2437						
MP3	012716	90-2466	90-2487	#90-2494						
MP4	012552	89-2373	#90-2467							
MP5	012764	#90-2506								
MRUNSE	053640	#387-434	437-1624							
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MSEEDL	002722	#42-1324	*47-1448	47-1450						
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MSGA87	115753	*92-2536	*92-2540	#568-4957						
MSGA98	116242	*483-2763	#568-4970							
MSGB34	113642	*131-3268	#568-4900							
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MSG001	111254	273-5962	#568-4840							
MSG002	111336	273-5963	#568-4841							
MSG003	111413	273-5964	#568-4842							
MSG004	111520	273-5970	273-5988	#568-4844						
MSG005	111626	276-6015	#568-4846							
MSG006	111640	497-3467	#568-4847							
MSG007	111675	278-6049	#568-4848							
MSG008	111707	276-6029	#568-4849							
MSG009	111721	278-6089	#568-4850							
MSG010	111733	278-6135	#568-4851							
MSG011	111745	273-5974	273-5987	#568-4852						
MSG012	112033	273-5977	273-5989	#568-4853						
MSG013	112130	276-6018	#568-4854							
MSG014	112132	273-5986	276-6020	278-6145	459-2222	466-2388	468-2456	#568-4855		
MSG015	112134	*133-3297	133-3298	*276-6038	276-6039	*278-6056	*278-6077	278-6078	*278-6094	*278-6097
		*278-6099	278-6102	*278-6116	*278-6120	*278-6125	278-6126	*278-6138	*278-6142	278-6143
		*472-2510	*472-2512	472-2514	*472-2530	*472-2532	472-2534	#568-4856		
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		#568-4859								
MSG019	112164	#568-4860								
MSG020	112170	338-7126	#568-4861							
MSG021	112224	338-7141	#568-4862							
MSG022	113252	363-7782	#568-4885							
MSG023	113274	342-7211	#568-4886							
MSG024	113316	342-7214	#568-4887							
MSG025	113340	340-7196	342-7225	#568-4888						
MSG026	113371	338-7136	#568-4889							
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MSG028	113420	342-7221	#568-4891							
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MSG033	113552	344-7261	346-7301	#568-4896				
MSG034	113571	131-3269	#568-4897					
MSG035	113707	107-2803	#568-4902					
MSG036	113712	346-7273	#568-4903					
MSG037	113731	346-7304	#568-4904					
MSG038	113750	346-7313	#568-4905					
MSG039	113766	346-7306	#568-4906					
MSG040	114010	348-7326	#568-4907					
MSG041	114055	348-7335	#568-4908					
MSG042	114102	348-7339	#568-4909					
MSG043	114123	348-7344	#568-4910					
MSG044	114150	348-7349	353-7500	355-7573	357-7649	#568-4911		
MSG045	114175	348-7356	353-7507	355-7580	357-7656	#568-4912		
MSG046	114231	348-7368	351-7462	353-7518	355-7591	357-7667	#568-4913	
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MSG048	114303	338-7129	#568-4915					
MSG049	114343	348-7364	#568-4916					
MSG050	114375	351-7455	#568-4917					
MSG051	114503	401-778	#568-4919					
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MSG056	114663	353-7516	357-7665	#568-4924				
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MSG059	114766	355-7553	#568-4927					
MSG060	115016	355-7589	#568-4928					
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MSG066	115142	460-2268	#568-4934					
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MSG068	115234	466-2414	#568-4936					
MSG069	115241	466-2416	#568-4937					
MSG070	115246	96-2654	#568-4938					
MSG071	115271	96-2656	#568-4939					
MSG072	115304	96-2658	#568-4940					
MSG073	115317	357-7648	#568-4941					
MSG074	115336	*470-2472	*470-2493	470-2497	*474-2544	*474-2558	474-2560	#568-4943
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MSG076	115373	355-7630	#568-4945					
MSG077	115414	107-2801	#568-4946					
MSG078	115430	133-3296	#568-4947					
MSG079	115474	355-7621	#568-4948					
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MSG081	115560	90-2474	#568-4950					

SYMBOL	VALUE	REFERENCES							
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MSG091	116034	481-2730	481-2746	#568-4962					
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MSG094	116070	489-3022	#568-4965						
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MSG096	116106	#568-4967							
MSG097	116137	144-3570	#568-4968						
MSG098	116234	483-2764	#568-4969						
MSG099	116245	483-2774	#568-4972						
MSG100	116256	489-3014	#568-4973						
MSG101	116305	359-7711	#568-4974						
MSG102	116335	359-7716	#568-4975						
MSG103	116364	340-7170	#568-4976						
MSG104	116421	464-2362	#568-4977						
MSG105	116423	361-7745	#568-4978						
MSG106	116527	359-7722	#568-4979						
MSG107	116545	359-7728	#568-4980						
MSG108	116622	359-7734	#568-4981						
MSG109	116664	361-7740	#568-4982						
MSG110	116737	361-7759	#568-4983						
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MSG112	117035	456-2142	#568-4985						
MSG113	117103	474-2568	#568-4986						
MSG114	117113	474-2571	#568-4987						
MSG115	117123	474-2574	#568-4988						
MSG116	117133	474-2577	#568-4989						
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MTPA04	026650	154-3843	#195-4513						
MTPA20	032572	162-3955	#236-5279						
MTPA21	033234	164-4031	#243-5416						
MTPA24	034060	165-4077	#253-5582						
MTPA25	034464	258-5653	258-5688	260-5696	#260-5707				
MTPA26	034576	167-4110	#263-5738						
MTPA32	034772	#267-5816	377-292						
MTPB03	026550	154-3826	#191-4476						
MTPB04	026704	154-3844	154-3855	#195-4526					
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MTPB24	034120	165-4078	#255-5626						
MTPB25	034504	258-5690	260-5698	#260-5714					
MTPB26	034612	167-4115	#263-5745						
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MTPC24	034134	165-4079	#255-5634						
MTPC25	034536	258-5692	260-5701	260-5703	#260-5725				
MTPC26	034646	167-4111	#263-5763						
MTPD03	026630	154-3828	#193-4503						
MTPD21	033354	164-4041	#245-5468						
MTPD25	034412	258-5665	258-5667	258-5670	258-5672	#258-5688			
MTPD26	034666	167-4112	#263-5776						
MTPE25	034434	258-5676	258-5678	258-5681	258-5683	#260-5696			
MTP000	026376	67-1846	152-3786	169-4129	177-4306	#188-4413	188-4415	270-5945	369-133
MTP001	026422	152-3795	#188-4424	375-237					
MTP002	026454	152-3806	#188-4436	375-243					
MTP005	026724	154-3854	#195-4535						
MTP006	026760	156-3864	#198-4550						
MTP007	027150	156-3874	#201-4594						
MTP010	027250	156-3881	#203-4634						
MTP011	027356	158-3892	#206-4671						
MTP012	027766	158-3901	#209-4782						
MTP013	030344	158-3909	#212-4860						
MTP014	030716	158-3919	#217-4929						
MTP015	031312	160-3930	#220-5010						
MTP016	031700	160-3939	#223-5087						
MTP017	032302	160-3944	#228-5167						
MTP020	032360	#231-5201							
MTP022	033404	164-4050	164-4058	#248-5487					
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MTP030	034704	171-4184	240-5406	#265-5784					
MTP031	034714	173-4226	#265-5790	265-5812					
MTP033	035054	175-4258	#267-5839						
MTP034	035106	177-4285	#269-5859	269-5902					
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MTP20B	032376	162-3987	#231-5214	231-5223					
MTP20C	032430	162-3993	#231-5227	231-5236					
MTP20D	032462	162-4000	#231-5240	231-5249					
MTP20E	032514	162-4006	#233-5254	233-5263					
MTP20F	032546	162-4012	#233-5267	233-5274					
MTV020	023320	*162-3957	162-3958	*162-3971	162-3971	#162-3973			
MT0000	02170	#152-3781	348-7396						
MT0001	021740	149-3688	151-3745	#152-3789	348-7397				
MT0002	022000	149-3689	151-3746	#152-3798	348-7398				
MT0003	022050	151-3747	#154-3811	348-7399					
MT0004	022216	149-3690	151-3748	#154-3836	348-7400				
MT0005	022300	149-3691	151-3749	#154-3847	348-7401				
MT0006	022360	142-3454	#156-3860	348-7402					
MT0007	022414	149-3687	151-3744	#156-3867	348-7403				
MT0010	022456	142-3455	#156-3877	348-7404					
MT0011	022512	142-3457	#158-3886	348-7405					
MT0012	022570	142-3458	#158-3895	348-7406					
MT0013	022646	142-3459	#158-3904	348-7407					
MT0014	022722	142-3460	#158-3913	348-7408					
MT0015	023000	142-3461	#160-3924	348-7409					

EMKAB CREATED BY MACRO ON 1-AUG-79 AT 07:46 PAGE 19 SEQ 0579

SYMBOL CROSS REFERENCE CREF V01

SYMBOL	VALUE	REFERENCES								
MT0016	023056	142-3462	#160-3933	348-7410						
MT0017	023134	149-3686	151-3743	#160-3942	348-7411					
MT0020	023156	149-3693	#162-3949	348-7412						
MT0021	023612	149-3692	151-3750	#164-4021	348-7413					
MT0022	023734	149-3694	#164-4046	348-7414	357-7684					
MT0023	023766	151-3751	#164-4054	348-7415						
MT0024	024032	149-3696	151-3753	#165-4064	348-7416					
MT0025	024172	142-3456	#165-4090	348-7417						
MT0026	024240	149-3695	151-3752	#167-4100	348-7418					
MT0027	024370	102-2735	#169-4123	348-7419	351-7457					
MT0030	024754	104-2785	#171-4179	333-7036	335-7075	348-7420				
MT0031	025214	149-3697	151-3754	#173-4218	348-7421	353-7535				
MT0033	025340	149-3698	151-3755	#175-4238	348-7423					
MT0034	025530	149-3699	151-3756	#177-4276	348-7424					
MT0035	025652	149-3664	149-3685	149-3700	151-3730	151-3742	151-3757	#177-4297		
MT020X	023604	162-3991	162-3997	162-4004	162-4010	#162-4017				
MT020Y	023472	162-3985	#162-3999							
MT020Z	023322	162-3968	#162-3975							
MT0999	025772	54-1571	142-3463	142-3464	142-3465	142-3466	142-3467	142-3468	142-3469	142-3470
		142-3471	142-3472	142-3473	142-3474	142-3475	142-3476	142-3477	142-3478	142-3479
		142-3480	142-3481	142-3482	142-3483	142-3484	142-3485	149-3664	149-3702	149-3703
		149-3704	149-3705	149-3706	149-3707	149-3708	149-3709	149-3710	149-3711	149-3712
		149-3713	149-3714	149-3715	149-3716	149-3717	149-3718	149-3719	149-3720	149-3721
		151-3730	151-3759	151-3760	151-3761	151-3762	151-3763	151-3764	151-3765	151-3766
		151-3767	151-3768	151-3769	151-3770	151-3771	151-3772	151-3773	151-3774	151-3775
		151-3776	#179-4320	348-7422	348-7425	348-7426	348-7427			
MULHLT	056150	#403-791	403-792							
MULTIE	060746	408-979	408-1005	408-1022	410-1054	412-1088	412-1102	414-1121	414-1126	414-1131
		414-1136	414-1141	414-1146	414-1151	414-1156	414-1161	#414-1167		
MULTIO	002004	#38-1117	149-3654	151-3725	*359-7735	*361-7741				
MULTIP	003014	#42-1358	45-1407	*56-1610	83-2256	*90-2463	*90-2486	*92-2524	92-2533	104-2783
		400-711	407-911	407-920	*408-977	*408-1003	*408-1020	*410-1053	*412-1087	*412-1101
		*414-1120	*414-1125	*414-1130	*414-1135	*414-1140	*414-1145	*414-1150	*414-1155	*414-1160
		*414-1165	*416-1198							
MULTIU	056142	400-711	#403-788							
MUT	002116	#38-1156	*102-2734	*102-2737	*109-2848	*109-2850	*129-3198	*129-3209	*348-7380	*353-7529
		*357-7678	464-2355	477-2651	*477-2653	477-2667	*477-2669	*477-2672		
M13BAL	054472	389-516	#391-541							
NEMCNT	002072	#38-1146	*65-1805	65-1818	*67-1857	67-1877	67-1889	67-1907	67-1931	*283-6210
		283-6211	*283-6216	560-4703						
NEWBAN	002400	#38-1221	171-4206	*315-6697	315-6703	*317-6738	321-6825	321-6838		
NEWKER	042322	315-6712	317-6744	#321-6835						
NEWLOA	042370	81-2227	310-6642	313-6659	317-6724	#321-6848				
NOCLOC	002104	#38-1151	*50-1512	429-1460	431-1518					
NOECCF	002474	#38-1255	*133-3299	*133-3301	158-3887	158-3896	158-3914	160-3925	160-3934	
NOERRO	002530	#38-1269	*340-7192	*342-7208	*342-7222	459-2213	459-2233	460-2251	*460-2277	462-2304
		462-2316	464-2359	*477-2664	*477-2670					
NOFSMO	002526	#38-1268	*169-4132	*169-4153	*169-4175	*171-4186	*171-4203	*171-4214	338-7128	
NOIIST	002756	*36-1106	#42-1338	56-1590	83-2271	83-2283	89-2373	365-15	407-912	408-959
NONEM	002102	#38-1150	*65-1806	*67-1844	*67-1916	*67-1925	283-6208			
NONEXI	036646	65-1807	67-1845	281-6172	#283-6208					
NOPAR	002100	#38-1149	*45-1424	*45-1434	*65-1804	*67-1843	*67-1875	*75-2087	*75-2099	*81-2223

SYMBOL	VALUE	REFERENCES								
		*81-2228	*102-2750	*102-2762	*131-3251	*149-3660	*149-3677	*151-3726	*151-3734	*158-3910
		*162-3954	*171-4183	*173-4223	*175-4243	*177-4281	*258-5650	*258-5685	281-6168	281-6179
		281-6187	281-6192	344-7232	*344-7233	*344-7265	346-7271	*346-7272	*346-7317	*348-7388
		*348-7393	353-7497	*353-7544	355-7551	*355-7584	*355-7613	357-7646	*357-7693	
NOSCOP	002540	#38-1273	*164-4022	*164-4043	*165-4067	*165-4088	*171-4186	*171-4203	*171-4214	*173-4221
		*173-4234	*175-4241	*175-4270	*177-4279	*177-4294	*367-77	*408-952	*414-1183	456-2145
		460-2256								
NOTAB	002464	#38-1251	278-6079	*466-2384	*466-2386					
NULLFL	002436	#38-1237	*179-4322	331-7007	*331-7020					
OLDCAC	002370	#38-1217	*288-6289	288-6297	*290-6313	290-6317	*290-6331	290-6334		
OLDMAR	002376	#38-1220	*329-6955	*329-6959	*329-6979	*331-6995	331-7008	331-7009	331-7009	*348-7324
ONCE	002732	#42-1328	56-1581	56-1591	*56-1613					
ONES	002726	#42-1326	45-1407	67-1895	69-1981	69-1982	94-2579	94-2580	94-2581	94-2582
		135-3354	135-3356	154-3839	248-5496	248-5498	270-5924	270-5929	331-7014	365-14
		365-27	416-1191	416-1192	416-1210	447-1945	477-2631	477-2633	477-2635	477-2638
		477-2640	477-2642							
O.ADR1	075706	#506-3633	522-3944	522-3949	522-3953	*522-3961	*522-3968	530-4089	*532-4105	532-4121
		536-4158	536-4159	536-4193						
O.BACK	077302	516-3831	#522-3929							
O.BD	101366	530-4096	530-4097	#546-4399						
O.BIAS	075604	#504-3613	514-3816							
O.BKP	- 000016	#501-3573	506-3634	506-3636	506-3638	522-3949	522-3953	522-3959	522-3966	526-4011
		528-4051	530-4065	530-4088	532-4104	536-4157	536-4196			
O.BKPT	077324	516-3833	#522-3937							
O.BK1	100060	508-3656	#530-4066							
O.BRK	100042	508-3678	#530-4063							
O.BW	075566	#504-3588	512-3752	*514-3783	*518-3858	*518-3861	518-3872	518-3881	520-3902	520-3909
		520-3912	*520-3913	*520-3916	522-3929	522-3932	524-3979	*524-3997	*524-3999	*532-4119
		538-4206	544-4323							
O.BYT	076772	516-3824	#518-3861							
O.CAD	075560	#504-3585	*512-3738	512-3754	*518-3871	518-3874	518-3877	518-3879	518-3885	*520-3907
		*520-3909	520-3910	520-3914	*522-3932	524-3985	544-4326	544-4328		
O.CADV	100634	518-3880	524-3989	524-3998	#538-4204	546-4348				
O.CLGT	- 000024	514-3808	#546-4379							
O.CLSE	101214	512-3751	520-3894	520-3904	522-3931	#544-4321				
O.CMFD	075600	#504-3604	*514-3786	514-3814	*518-3850	518-3864				
O.CR	101316	544-4330	544-4332	544-4333	#546-4355					
O.CRET	077140	516-3825	#520-3894							
O.CRLF	101246	520-3911	530-4095	536-4176	#544-4330					
O.CRLS	101254	514-3784	#544-4332							
O.CSR1	075574	#504-3601	*536-4167	536-4183						
O.CSR2	075575	#504-3602	*536-4168	536-4184						
O.CT	075730	#506-3635	*522-3962	*522-3970	*528-4047	*532-4107	*532-4109			
O.CTLC	076162	#508-3685	516-3839							
O.CTLE	076242	#510-3705	516-3841							
O.CTLF	076210	#510-3695	516-3840							
O.C1	100000	#528-4051	532-4108							
O.DCD	076520	512-3766	512-3768	#514-3783	520-3895	532-4123				
O.DCDA	077144	#520-3895	522-3956	522-3963	522-3967					
O.DCD1	076550	514-3775	#514-3790	518-3851						
O.DCD3	076530	#514-3785	518-3882	518-3889	524-4000					
O.DOT	075562	#504-3586	*518-3870	520-3907	*520-3910					

SYMBOL		VALUE	REFERENCES								
O.ERR		076510	512-3757	#514-3781	514-3809	518-3866	520-3897	524-4002			
O.ERR1		077572	522-3942	522-3950	522-3954	522-3960	524-3980	524-3984	#524-4002	526-4008	526-4010
			526-4013	528-4039	528-4042	528-4044					
O.ERR2		077164	#520-3903	522-3930							
O.ERR3		077150	#520-3897	520-3903							
O.FIL		075576	#504-3603	*542-4292	*542-4295						
O.FTYP		100730	514-3782	518-3884	518-3886	518-3888	520-3921	524-3982	532-4112	532-4116	532-4118
			538-4219	538-4224	#538-4229	538-4230	540-4269	542-4289	542-4294		
O.GET		101006	510-3716	514-3792	#540-4250	540-4251	540-4270	540-4274			
O.GO		077576	516-3827	#526-4007							
O.GOGO		077624	510-3709	#526-4015							
O.GO2		077676	526-4022	#526-4025	528-4059						
O.ID		101300	508-3663	#546-4350							
O.IDND	=	101315	508-3664	#546-4354							
O.LG	=	000020	510-3720	#546-4397							
O.LGCH		101321	514-3805	#546-4359	546-4379						
O.MIN		076502	#514-3774	516-3838							
O.MINS		075603	#504-3611	*514-3774	*514-3787	514-3811	*514-3817				
O.ODT		075774	487-2948	#508-3647	510-3700						
O.OFST		077466	516-3832	#524-3979							
O.OLD		077154	516-3830	#520-3901							
O.OP1		077160	516-3828	#520-3902							
O.OP2		077220	#520-3910	522-3933							
O.OP2A		077226	512-3739	#520-3911							
O.ORAB		076364	#512-3740	516-3835							
O.ORPC		076342	#512-3734	516-3829							
O.ORRB		076374	#512-3743	516-3836							
O.P		075573	#504-3598	*508-3654	*508-3676	*526-4011	528-4040	528-4051	*530-4065	*532-4106	532-4113
			532-4120								
O.PRI		075704	#506-3629	508-3669	530-4070	530-4074					
O.PROC		077732	516-3834	#528-4038							
O.PR1		077764	528-4046	#528-4048							
O.RALL		077430	508-3679	522-3958	#522-3964						
O.RCSR	-	177560	#501-3579	536-4167	*536-4169	536-4179	536-4181	*536-4183	540-4250		
O.RDB		177562	#501-3578	540-4252							
O.REGT		076270	#510-3716	516-3826							
O.REM		100602	508-3668	530-4069	#536-4190						
O.RORA		101272	520-3915	532-4122	#546-4348						
O.RRST		101172	508-3649	#544-4302							
O.RSB		100450	526-4024	#536-4157							
O.RSR		100416	526-4025	#534-4143							
O.RSTT		100534	526-4018	528-4050	#536-4176						
O.S		075571	#504-3592	*508-3655	*508-3675	*512-3765	*512-3767	526-4021	528-4053	530-4084	536-4190
O.SCAN		076554	510-3727	#514-3792	514-3803						
O.SCRN		075602	#504-3609	540-4260	540-4271						
O.SEMI		076742	516-3822	#518-3847							
O.SEQ		075570	#504-3591	*520-3901	520-3905	*520-3908					
O.SMFD		075601	#504-3606	512-3761	*514-3785	*518-3849	518-3867	526-4007	528-4038		
O.SNGL		076446	#512-3761	516-3837							
O.STM	=	000340	#501-3575	508-3677	526-4016	528-4048	528-4055				
O.SVR		100360	508-3661	508-3667	530-4066	#534-4129					
O.SVTT		100500	508-3659	530-4094	532-4110	#536-4167					

SYMBOL	VALUE	REFERENCES								
O.T	075572	#504-3597	*526-4019	*528-4057	530-4067					
O.TBIT	077644	#526-4019	528-4052	528-4054	530-4068					
O.TBT	= 000020	#501-3576	526-4020	526-4023	526-4030	528-4058	530-4080			
O.TCL2	076442	#512-3757	512-3762							
O.TCSR	- 177564	#501-3581	536-4168	*536-4170	536-4171	536-4177	*536-4184	538-4229		
O.TDB	= 177566	#501-3580	*538-4243							
O.TL	101345	510-3717	510-3720	510-3728	#546-4381	546-4397				
O.TRTC	101370	522-3937	522-3965	536-4159	#546-4400					
O.TVEC	= 000014	#501-3574	508-3650	*508-3677	*508-3678					
O.TYPE	101126	508-3665	508-3688	510-3698	510-3707	530-4098	#542-4286	542-4291	542-4297	544-4334
O.TYP1	101004	#538-4244	542-4287							
O.UIN	075752	#506-3637	*522-3969	*536-4158	536-4193					
O.UPC	075700	#506-3627	*508-3653	*526-4015	526-4027	*530-4063	530-4083	*530-4087	*530-4100	
O.URO	075662	#506-3620	508-3662	510-3725						
O.USP	075676	#506-3626	508-3685	510-3695	*534-4130	534-4131	534-4150			
O.UST	075702	#506-3628	*526-4020	*526-4023	526-4026	526-4029	*528-4058	*530-4064	530-4072	*544-4302
O.WRD	076760	516-3823	#518-3858							
O.WRD1	077036	518-3869	#518-3872	520-3922						
O.WST	101202	508-3651	508-3674	526-4017	526-4031	528-4049	528-4056	530-4082	#544-4312	
O.XXX	075564	#504-3587	*534-4129	534-4137	*534-4144	534-4151				
PADDRE	002042	#38-1135	*281-6176	560-4702						
PAFBAF	015730	99-2720	#120-3010	120-3039	120-3047					
PAFBAW	016066	99-2721	#122-3052	122-3083	122-3088	122-3096				
PARBAF	016246	99-2722	#124-3101	124-3130	124-3138					
PARBAW	016404	99-2723	#126-3143	126-3174	126-3179	126-3187				
PARCNT	002074	#38-1147	*65-1803	65-1815	*67-1856	67-1887	67-1905	67-1927	*81-2229	*102-2755
		102-2757	*281-6173	281-6174	560-4702					
PARITY	036454	47-1465	#281-6168							
PARTHE	002372	#38-1218	*258-5652	*260-5714	*260-5725	*260-5728	281-6189	344-7232	*344-7248	*344-7265
		346-7271	*346-7287	*346-7317	*355-7585					
PARVEC	000114	#11-331	*47-1465	*47-1466						
PASFLG	002362	#38-1213	*129-3199	*131-3253	*171-4180	171-4197	*171-4198	206-4698	206-4769	*206-4771
		212-4872	214-4916	*214-4918	217-4944	217-4997	*217-4999	220-5021	220-5074	*220-5076
		223-5100	225-5154	*225-5156	*348-7381					
PATERR	002076	#38-1148	67-1848	*67-1855	67-1885	67-1903				
PATPLU	005472	54-1551	54-1553	54-1556	54-1558	54-1561	54-1563	#54-1567		
PATTER	002120	#38-1157	*109-2844	*111-2867	*113-2910	*115-2937	*117-2987	*120-3011	*122-3053	*124-3123
		*126-3167	149-3662	151-3728	*327-6932	327-6933	*327-6938	348-7323	*348-7341	348-7342
		348-7343	348-7390	*348-7435	351-7448	*351-7491	353-7497	*353-7544	357-7646	*357-7693
PCBUMP	002406	#38-1224	*149-3661	*151-3727	*154-3813	*154-3838	*154-3849	*156-3862	*156-3879	*167-4102
		281-6183	348-7323	*348-7389	*348-7433					
PCONFI	035402	96-2660	#273-5953	348-7441						
PCONFS	035662	*273-5955	273-5992	#273-5998						
PCONF1	035572	273-5966	#273-5983							
PCONF2	035630	273-5956	273-5981	#273-5992						
PDP110	036752	47-1467	#283-6230							
PENDBO	002330	#38-1197	*64-1708	*64-1735	77-2136	77-2137				
PERA05	064732	#445-1908	445-1915							
PERBNK	065564	393-599	448-1989	448-2001	450-2016	#452-2037	454-2111			
PERECC	065650	#452-2053	452-2065							
PERRAB	065402	445-1930	445-1935	#448-2000						
PERRAW	065330	393-580	395-612	445-1887	445-1893	445-1899	445-1905	445-1920	445-1925	447-1941

SYMBOL	VALUE	REFERENCES								
		447-1946	447-1951	447-1956	447-1961	447-1966	447-1976	447-1981	447-1986	#448-1988
PERRA3	054652	#393-582	450-2022	450-2026						
PERRA7	065454	447-1971	#450-2013							
PERR01	= 104427	#9-198	188-4432	267-5854						
PERR02	= 104430	#9-199	188-4420	188-4445	267-5848					
PERR03	= 104431	#9-200	193-4498	193-4506						
PERR04	= 104432	#9-201	195-4522	195-4544						
PERR05	064726	#445-1907								
PERR06	064754	#445-1914								
PERR07	= 104433	#9-202	198-4560	198-4579						
PERR10	= 104434	#9-203	198-4565	198-4584						
PERR11	= 104435	#9-204	201-4602	203-4652	236-5309	238-5353	240-5396			
PERR12	= 104436	#9-205	201-4608	203-4659						
PERR13	= 104437	#9-206	201-4616							
PERR14	= 104440	#9-207	201-4622							
PERR15	= 104441	#9-208								
PERR16	= 104442	#9-209								
PERR17	= 104443	#9-210	243-5421	243-5443	243-5454	245-5478	250-5535	250-5539		
PERR20	= 104444	#9-211	243-5427	243-5437	243-5460	245-5472	250-5544	250-5548		
PERR21	= 104445	#9-212	238-5332	240-5378						
PERR22	= 104446	#9-213	228-5189	267-5834						
PERR23	= 104447	#9-214	253-5611	255-5640						
PERR24	= 104450	#9-215	253-5616							
PERR25	= 104451	#9-216	263-5751	263-5756						
PERR26	= 104452	#9-217	231-5219	231-5244	233-5271					
PERR27	= 104453	#9-218	231-5231	233-5259						
PERR30	= 104454	#9-219	265-5797							
PERR31	= 104455	#9-220	206-4725	206-4731	217-4975	217-4981	220-5055	220-5060	223-5131	223-5137
PERR32	104456	#9-221	206-4737	206-4751						
PERR33	= 104457	#9-222	209-4821							
PERR34	= 104460	#9-223	206-4743	206-4757	209-4829					
PERR35	= 104461	#9-224	269-5871	269-5878						
PERR36	= 104462	#9-225								
PERR37	= 104463	#9-226								
PERR40	= 104464	#9-227								
PERR41	= 104465	#9-228								
PERR42	= 104466	#9-229								
PERR43	= 104467	#9-230								
PERXOR	065540	448-1992	448-2004	450-2015	#450-2028	452-2060	454-2096			
PFLAG	002130	#38-1161	109-2847	313-6654	*324-6879	*324-6900	389-466	412-1076	420-1252	423-1317
		425-1377	427-1425	429-1467	433-1534	437-1623	439-1684			
PHYADD	002044	#38-1136	*468-2434	*468-2435	*468-2436	*468-2437	*468-2439	468-2440		
PORTCO	002646	#40-1304	*373-172	373-191	*373-191	*373-198	*389-469	*389-469	*389-469	*389-469
		*389-504	391-546	391-547	429-1491	429-1492	435-1583	435-1584	560-4718	560-4718
		560-4718	560-4718	560-4725	560-4725	560-4725	560-4725			
PORTDI	002606	#40-1300	*56-1600	*56-1607	*83-2279	92-2520	92-2520	92-2535	92-2542	365-23
		407-920	560-4719	560-4719	560-4719	560-4719				
PSW	- 177776	#11-261	*60-1651	*60-1652	*60-1658	*67-1868	*67-1881	*67-1898	*67-1920	*69-1969
		*135-3332	*146-3630	*173-4225	*175-4251	*177-4284	*182-4357	*185-4391	*273-5959	*290-6345
		*290-6347	*315-6699	*317-6740	*319-6791	*319-6807	*335-7087	*344-7251	*346-7291	*346-7309
		*348-7372	*351-7466	*353-7522	*355-7595	*355-7602	*357-7671	*365-22	*365-30	*365-59
		*367-67	*367-81	*369-101	*371-146	*371-158	*373-165	*373-169	*373-190	*375-232

SYMBOL VALUE REFERENCES

PTYBUF 002636 #40-1303 83-2288 *371-149 371-153 371-159 *371-159 *407-928 *408-966 *437-1628 437-1649 437-1650 483-2765 483-2766

PTYFLA 002626 #40-1302 407-926 *407-929 456-2136 456-2136 456-2136 456-2136 483-2759 *483-2767 483-2770 *483-2775

PWLOCK 002760 #42-1339 *397-642 *403-789

PWRVEC = 000024 #11-324 *47-1463 *47-1464 *52-1529 *397-646 *397-647 *398-704 *400-712 *401-777 403-800 403-801 *403-803 *403-804 *405-837 *405-838

QUE 072154 89-2393 90-2443 90-2480 389-482 389-528 408-973 408-1016 410-1046 412-1082 420-1265 420-1287 423-1329 423-1351 425-1401 427-1442 429-1478 435-1603 437-1636 439-1701 441-1726 456-2137 #483-2754

QUE1 072222 #483-2765 483-2772

QUICK 002536 #38-1272 *52-1528 335-7074

QVFLAG 002440 #38-1238 *52-1528 *52-1532 107-2802 *107-2804 162-3984 206-4764 209-4846 214-4911 217-4992 220-5069 225-5149 329-6952 331-6992

RANODD 034626 *167-4114 #263-5753 *263-5757

RDCHR = 104411 #9-177 490-3085

RDDEC = 104414 #9-180 338-7137

RDLIN 104412 #9-178 491-3162 491-3213

RDOCT = 104413 #9-179 56-1593 342-7212 342-7215 344-7236 346-7275 346-7307 348-7328 348-7340 348-7345 348-7350 353-7501 355-7560 355-7574 357-7650 359-7703 361-7750 363-7783

READCS - 104426 #9-196 64-1709 77-2152 133-3294 137-3395 139-3427 146-3636 236-5303 238-5325 238-5347 240-5371 240-5390 258-5662 260-5719 260-5730 296-6413 296-6432 298-6448 298-6467 340-7191 342-7206 342-7220 393-586 398-684 470-2477 479-2690

READON 002504 #38-1259 *369-105 *369-116 369-139 *375-231 375-256 *375-258 *377-270 *377-276

REALPA 002366 #38-1216 *152-3782 *152-3790 *152-3799 *154-3812 *154-3837 *154-3848 *156-3861 *156-3868 *156-3878 *158-3891 *158-3900 *158-3908 *158-3918 *160-3929 *160-3938 *160-3943 *162-3953 *164-4023 *164-4049 *164-4057 *165-4068 *165-4094 *167-4101 *169-4126 *171-4181 *173-4222 *175-4242 *177-4280 *177-4298 *179-4321 *371-150 452-2066 452-2069 452-2072 452-2075 457-2178 466-2400 489-3028

REFRES 033760 248-5522 #250-5559

REFSUB 034030 250-5562 250-5566 #250-5570

REGCOP 035204 152-3785 152-3794 #270-5907 369-136

RELOCA 041130 111-2885 113-2919 115-2960 117-3001 120-3044 122-3093 124-3135 126-3184 171-4200 #313-6649

RELOC1 041456 #315-6697 367-70

RESREG = 104416 #9-183 154-3829 165-4084 167-4116 270-5948 319-6774 319-6811 338-7130 340-7184 #369-140 377-296 418-1237 464-2358 495-3346

RESTAR 002752 *36-1102 *36-1104 #42-1336 50-1483

RESVEC = 000010 #11-319 *47-1467 *47-1468

RLFLAG 002134 #38-1163 111-2882 113-2916 115-2957 117-2998 120-3041 122-3090 124-3132 126-3181 *315-6714 *317-6746 324-6901 333-7035 335-7073 338-7128 *367-76 397-659 457-2188 483-2776 489-3017

RRFLAG 002132 #38-1162 111-2865 113-2899 115-2935 117-2976 120-3020 122-3064 124-3111 126-3155 131-3240 169-4136 169-4159 171-4190 *324-6879 *324-6885 *324-6900 *324-6903 *324-6911 348-7363 351-7479 353-7533 357-7682

SAVREG - 104415 #9-182 154-3823 165-4076 167-4109 270-5942 319-6772 319-6775 338-7125 369-137 377-293 418-1223 462-2289 495-3331

SBECSR 002150 #38-1168 *149-3672 *149-3673 *236-5283 *236-5284 474-2545 474-2548

SBEFLA 002022 #38-1127 104-2773 *107-2796 *149-3671 *236-5282

SYMBOL	VALUE	REFERENCES								
SBEMSK	002350	#38-1210	*206-4693	*206-4694	206-4709	206-4711	206-4759	*206-4761	*206-4761	*209-4788
		*209-4789	209-4794	209-4796	209-4806	209-4841	*209-4843	*209-4843	*212-4866	*212-4867
		212-4877	212-4879	212-4883	212-4885	214-4912	*214-4914	*214-4914	*217-4938	*217-4939
		217-4949	217-4951	217-4955	217-4957	217-4993	*217-4995	*217-4995	*220-5015	*220-5016
		220-5026	220-5028	220-5032	220-5034	220-5070	*220-5072	*220-5072	*223-5094	*223-5095
		223-5104	223-5106	223-5110	223-5112	225-5150	*225-5152	*225-5152		
SBETES	017374	131-3247	#135-3306							
SCOPE	= 000004	#11-260	64-1689	65-1796	67-1833	69-1956	71-2031	99-2710	102-2730	102-2740
		182-4363	185-4397							
SDPAR0	= 172260	#11-429	154-3828	165-4078	165-4080	167-4112	193-4501	253-5623		
SDPAR7	= 172276	#11-436								
SDPDR7	= 172236	#11-416								
SECOND	= 011661	#13-559	89-2391	389-481	389-527	408-972	408-999	408-1015	412-1081	416-1193
		420-1264	420-1286	423-1328	423-1350	425-1400	427-1441	429-1477	435-1602	437-1635
		439-1700	441-1725							
SEEDHI	002714	#42-1321	*47-1449	167-4104	*167-4119	387-439	493-3304	493-3311	*493-3316	
SEEDLO	002716	#42-1322	*47-1450	167-4103	*167-4118	493-3303	493-3309	*493-3315		
SELONL	002002	#38-1116	102-2733	102-2748	131-3227	324-6910	*361-7760	*361-7765		
SETMAR	043212	113-2903	117-2980	124-3113	126-3157	#331-6989				
SETPAT	042762	113-2901	117-2978	#327-6936						
SHALT	004420	#45-1412								
SHUTUP	043554	107-2813	335-7054	#335-7062						
SIDE	002422	#38-1231	*131-3234	131-3268	*131-3271	131-3271	144-3506	144-3522	144-3538	144-3554
		144-3582	144-3598	144-3614	146-3647	146-3648	*162-3961			
SIDEOK	021066	131-3244	#146-3624							
SIPAR0	= 172240	#11-419	310-6606							
SIPAR3	= 172246	#11-422	310-6620							
SIPDR0	= 172200	#11-399	310-6608	397-663	400-748					
SIZE	= 040000	#13-558	65-1809	67-1864	67-1893	67-1918	152-3784	152-3792	152-3801	154-3818
		154-3842	154-3853	167-4108	169-4141	169-4164	171-4191	175-4247	175-4266	177-4300
		240-5408	267-5850	270-5944	315-6700	317-6741	319-6792	319-6808	351-7484	367-87
		369-107	375-249	377-269	377-290	425-1383				
SIZELO	- 177760	#11-343	79-2172	79-2174	79-2176	79-2180				
SKIPKA	002012	#38-1120	340-7172	*340-7174	*359-7712	*359-7718				
SLAVEM	061244	58-1626	416-1214	#418-1221						
SLAVEN	075774	#506-3639	568-5002	568-5003						
SLAVER	002570	#38-1285	459-2242	*483-2777	*483-2779					
SLAVES	002730	#42-1327	*56-1594	56-1596	56-1596	56-1599	75-2108	*75-2109	*77-2130	*89-2396
		*90-2449	*90-2455	90-2462	*90-2486	90-2492	92-2515	92-2543	98-2699	324-6892
		381-341	381-342	389-475	389-490	389-523	389-536	391-553	408-983	408-1026
		410-1059	412-1104	414-1117	420-1278	420-1296	420-1300	423-1342	423-1360	423-1364
		425-1393	425-1409	427-1434	427-1450	429-1472	429-1486	429-1498	431-1521	433-1549
		433-1556	433-1564	433-1568	435-1596	437-1630	437-1644	437-1655	439-1693	439-1709
		439-1712	441-1734							
SLAVE1	= 000040	#13-562	83-2257	94-2571	94-2580	278-6096	407-921			
SLAVE2	= 000100	#13-563	83-2261	94-2571	94-2581	278-6096	407-922			
SLAVE3	= 000200	#13-564	83-2265	94-2571	94-2582	278-6096	407-923			
SLAVUP	061216	85-2316	383-358	408-986	#416-1213					
SLFLAG	002656	#40-1305	*94-2578	*94-2578	*94-2578	*94-2578	*94-2579	*94-2580	*94-2581	*94-2582
		*381-340	*381-345	381-350	*381-350	389-503	560-4701	560-4701	560-4701	560-4701
SLPAT	051570	369-120	369-122	369-124	369-126	369-128	#369-130			
SLPAT0	051530	#367-89	#369-109	#369-119	377-271					

SYMBOL	VALUE	REFERENCES								
SLPAT1	051534	367-90	369-110	#369-121	377-272					
SLPAT2	051542	367-91	369-111	#369-123	377-273					
SLPAT3	051550	367-92	369-112	#369-125	377-274					
SLPAT4	051556	367-93	369-113	#369-127	377-275					
SLPAT5	051564	367-94	369-114	#369-129						
SOBK	002704	#42-1317	173-4228							
SOBLEN	= 000056	173-4226	173-4231	#265-5812						
SOFTPA	002744	#42-1333	*47-1453	*104-2780	177-4301					
SOURCE	002402	#38-1222	*206-4704	*209-4792	*212-4881	*217-4953	*220-5030	*223-5108	*258-5648	305-6539
SPECIA	002432	#38-1235	131-3244	*137-3394	*144-3500	*144-3516	*144-3532	*144-3548	*144-3576	*144-3592
		*144-3608	162-3963							
SSP	-%000006	#11-277	*60-1655	*182-4358	*185-4392	398-675	*401-757	481-2719		
ST	- 177776	#501-3572	544-4302	*544-4312						
STACK	= 002000	#11-255	11-256	36-1094	36-1108	42-1318	45-1428	52-1531	90-2507	107-2809
		367-71	408-978	408-1004	408-1021	408-1028	412-1105			
START	004352	36-1103	36-1105	#45-1403	77-2158	89-2387	335-7059	403-793		
START1	000300	36-1098	#36-1102	36-1107						
START2	000310	36-1099	#36-1104							
START3	000200	#3 -1098	568-5012							
START4	000322	36-1100	#36-1106							
STOPCP	011720	#83-2282	375-224							
STOPOK	002520	#38-1265	*81-2239	456-2140	*456-2141					
STRIPE	002460	#38-1249	*248-5501	248-5505	250-5526	*250-5556	250-5556			
STRTDI	002364	#38-1215								
SUBAAA	005532	54-1565	#56-1578							
SUBAAB	005200	#52-1516								
SUBAAQ	007720	67-1876	#69-1937							
SUBAAR	013160	83-2256	#92-2546							
SUBAAS	007002	64-1776	#65-1795							
SUBAAT	011334	79-2173	79-2186	#81-2201						
SUBAAU	014602	102-2764	#104-2773							
SUCCES	002424	#38-1232	*131-3237	*131-3258	131-3266	*355-7623	355-7629	*355-7631	*475-2589	475-2613
		475-2620	*477-2629	*477-2631	*477-2633	*477-2635	*477-2638	*477-2640	*477-2642	
SUPDUA	002360	#38-1212	*154-3824	*156-3864	*156-3874	*156-3881	*158-3892	*158-3901	*158-3909	*158-3919
		*160-3930	*160-3939	*160-3944	*162-3955	*164-4050	*164-4058	*165-4080	*165-4095	*169-4131
		*173-4232	*175-4264	*177-4289	*177-4308	185-4394	*369-135	*371-151	*373-181	*375-252
SUPDO1	026042	102-2756	152-3787	152-3796	152-3807	162-3983	164-4032	167-4113	167-4117	169-4144
		169-4167	171-4193	177-4314	#182-4334	270-5947	369-138	375-255	377-294	
SUPDO2	026056	154-3830	154-3845	154-3856	162-3988	162-3994	162-4001	162-4007	162-4013	164-4035
		164-4039	164-4042	175-4269	#182-4336	377-297				
SUPDO3	026220	154-3825	156-3865	156-3875	156-3882	158-3893	158-3902	158-3911	158-3920	160-3931
		160-3940	160-3945	164-4051	164-4060	165-4096	169-4147	169-4170	177-4311	#185-4369
		351-7486	369-139	371-154	375-256					
SUPDO4	026234	162-4017	165-4081	165-4087	173-4233	175-4265	177-4293	#185-4370	373-182	373-186
SUPDR0	002266	#38-1179	*182-4338	182-4346	*185-4372	185-4380				
SUPDR1	002270	#38-1180	182-4339	185-4373						
SUPDR2	002272	#38-1181								
SUPDR3	002274	#38-1182								
SUPDR4	002276	#38-1183								
SUPDR5	002300	#38-1184								
SUPDR6	002302	#38-1185	182-4349	185-4383						
SUPLIM	057372	#407-947	568-4997	568-4998						

SYMBOL	VALUE	REFERENCES								
SUPM13	053752	#389-458	437-1663							
SUPSTK	= 000740	#11-257	60-1654	182-4358	185-4392	481-2722	48'-2728			
SWAPAT	002764	#42-1343	*47-1452							
SWR	002766	#42-1346	*50-1496	50-1498	*50-1503	*52-1525	62-1666	65-1826	69-2022	89-2370
		*89-2371	89-2372	*90-2494	96-2659	99-2712	107-2802	149-3655	149-3668	162-3984
		162-3989	162-3995	162-4002	162-4008	206-4763	209-4845	214-4910	217-4991	220-5068
		225-5148	273-5966	313-6650	313-6666	313-6687	329-6952	331-6992	348-7355	348-7383
		351-7450	353-7506	353-7511	355-7554	355-7579	355-7603	357-7655	357-7660	398-700
		400-719	408-956	*408-957	408-958	*412-1107	456-2140	456-2148	456-2164	459-2219
		459-2242	459-2245	460-2252	460-2256	464-2359	487-2952	487-2960	487-2982	
SWREG	= 000176	#13-550	50-1503	62-1666	89-2371	408-957	487-2952			
SW0	= 000001	#11-297	65-1826	69-2022	149-3655	149-3668	162-3989	162-3995	162-4002	162-4008
		348-7383	351-7450	353-7511	355-7554	357-7660				
SW1	= 000002	#11-296								
SW10	= 002000	#11-287	459-2219							
SW11	= 004000	#11-286	107-2802	162-3984	206-4763	209-4845	214-4910	217-4991	220-5068	225-5148
		329-6952	331-6992	348-7355	353-7506	355-7579	357-7655			
SW12	= 010000	#11-285	313-6650							
SW13	= 020000	#11-284	313-6666	313-6687	459-2242					
SW14	= 040000	#11-283	456-2148							
SW15	100000	#11-282								
SW2	= 000004	#11-295								
SW3	000010	#11-294								
SW4	000020	#11-293	273-5966							
SW5	= 000040	#11-292	459-2245							
SW6	= 000100	#11-291	96-2659							
SW7	000200	#11-290	464-2359							
SW8	= 000400	#11-289	456-2140							
SW9	= 001000	#11-288	456-2164	460-2256						
SYSSIZ	011210	79-2178	79-2182	#79-2189						
SYSTID	= 177764	#11-347	56-1600	83-2272	365-16	407-913				
TAG2$	007366	67-1851	#67-1873							
TAG3$	007412	67-1872	#67-1877							
TAG4$	026136	182-4347	#182-4349							
TAG70$	067636	464-2332	#466-2369							
TAG71$	067646	464-2333	#466-2375							
TAG72$	067656	464-2334	#466-2381							
TAG73$	067722	464-2335	#466-2394							
TAG74$	067730	464-2336	#466-2400							
TAG75$	067742	464-2337	#466-2406							
TAG76$	067754	464-2338	#466-2412							
TAG77$	067776	464-2339	#468-2423							
TAG78$	070000	464-2340	#468-2428							
TAG79$	070006	464-2341	#468-2434							
TAG80$	070066	464-2342	#468-2448							
TAG81$	070100	464-2343	#468-2454							
TAG82$	070122	464-2344	#470-2472							
TAG83$	070324	464-2345	#472-2504							
TAG84$	070410	464-2346	#472-2522							
TAG85$	070502	464-2347	#474-2543							
TAG86$	070612	464-2348	#474-2567							
TAG9$	007232	#67-1849	67-1879	67-1912	67-1934					

SYMBOL	VALUE	REFERENCES								
TASK	002616	#40-1301	*83-2285	*83-2298	90-2453	90-2490	365-31	365-35	*365-60	367-82
		369-102	375-233	377-264	377-281	*379-306	*389-474	389-488	*389-522	389-534
		408-981	408-1024	*410-1043	410-1057	*412-1080	412-1090	*416-1217	*420-1258	420-1271
		*420-1277	420-1293	*423-1322	423-1335	*423-1341	423-1357	*425-1391	425-1407	*427-1433
		427-1448	*429-1471	429-1484	*433-1542	*433-1555	435-1609	*437-1629	437-1642	*439-1689
		*439-1691	439-1707	*441-1724	441-1732					
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		425-1395	427-1436	429-1473	433-1544	433-1557	437-1631	439-1695		
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TASK02	051330	365-41	#367-80							
TASK03	051430	365-42	#369-100							
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TASK07	052326	365-46	#375-226							
TASK10	052336	365-47	#375-230							
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TASK13	052726	365-50	#379-301							
TASK14	053276	365-51	#383-356							
TASK15	053310	365-52	#383-361							
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TASK17	053334	365-54	#383-370							
TASK20	053422	365-55	#385-385							
TASK7A	052344	375-228	#375-232							
TBG4$	026314	185-4381	#185-4383							
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TESTAD	002506	#38-1260	*131-3246	*131-3261	131-3261	135-3331	156-3863	156-3880	206-4713	206-4775
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TIME	002434	#38-1236	*351-7458	351-7460						
TIMEOU	036726	47-1469	50-1502	50-1513	56-1612	60-1646	64-1774	65-1823	67-1874	75-2098
		#283-6223	340-7194	340-7198	342-7210	342-7227	344-7266	346-7318	457-2195	
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		*351-7474	353-7497	353-7497	*353-7519	*353-7520	*353-7544	*353-7544	355-7551	355-7551
		*355-7592	*355-7593	*355-7613	*355-7613	357-7646	357-7646	*357-7668	*357-7669	*357-7693
		*357-7693								
TMFLAG	002140	#38-1165	*120-3035	*122-3079	*124-3126	*126-3170	327-6922			
TOOMAN	002472	#38-1254	*452-2049	459-2245	*460-2277					
TRAPVE	000034	#11-326	*47-1461	*47-1462						
TRT	000003	#501-3577	522-3969	546-4400						
TSK05A	052240	373-170	#373-201	373-215						
TSK13A	053100	379-302	#379-324							
TSK13B	053136	379-335	#381-338							
TSK20A	053602	385-386	#385-422							
TSTBAN	007606	67-1860	#67-1915							
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SYMBOL	VALUE	REFERENCES								
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		*212-4886	*212-4888	*212-4890	212-4892	212-4894	*217-4942	*217-4943	*217-4946	*217-4947
		217-4953	*217-4956	*217-4958	*217-4960	*217-4962	217-4965	217-4967	217-4973	217-4979
		*220-5019	*220-5020	*220-5023	*220-5024	220-5030	*220-5033	*220-5035	*220-5037	*220-5039
		220-5042	220-5045	220-5053	220-5058	*223-5098	*223-5099	*223-5102	*223-5103	223-5108
		*223-5111	*223-5113	*223-5115	*223-5117	223-5120	223-5122	223-5129	223-5135	*258-5646
		*258-5647	258-5648	*258-5664	*258-5666	*258-5668	*258-5669	*258-5671	*258-5674	*258-5675
		*258-5677	*258-5679	*258-5680	*258-5682	260-5708	260-5710	447-1950	447-1955	452-2056
		452-2058	560-4713	560-4713						
TSTRD1	037434	290-6323	#290-6344							
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TST1	006260	#64-1689								
TST2	007004	#65-1796								
TST3	007160	#67-1833								
TST4	010310	#71-2031								
TST5	014342	#99-2710								
TST6	014414	#102-2730								
TST7	014456	#102-2740								
TWOCSR	002600	#38-1289	*77-2141	*77-2149	288-6281	288-6292	*342-7217	*342-7219		
TYPDS	- 104405	#9-171	96-2653	96-2655	96-2657	107-2806	351-7460	355-7620	355-7636	466-2375
TYPEIT	- 104401	#9-167	56-1582	56-1592	90-2474	90-2476	92-2522	92-2534	92-2541	96-2652
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		273-5977	273-5986	273-5987	273-5988	273-5989	276-6015	276-6018	276-6020	276-6029
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		346-7273	346-7274	346-7297	346-7301	346-7304	346-7306	346-7313	348-7326	348-7327
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		363-7782	401-778	407-893	456-2142	459-2221	459-2222	460-2268	462-2290	462-2310
		462-2311	462-2313	462-2320	462-2322	464-2352	464-2362	466-2388	466-2414	466-2416
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		491-3248	491-3250	491-3251	491-3252	497-3467				
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		481-2741	481-2743	487-2960						
TYPOS	= 104403	#9-169	90-2475	92-2535	92-2542	344-7254	346-7305	346-7314	355-7633	466-2400
		466-2406	468-2448	468-2455	489-3015	489-3021	489-3026	489-3028		
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T12B	031722	#223-5096	225-5153							
UDPAR0	- 177660	#11-389	255-5641							
UDPAR1	- 177662	#11-390	381-347	381-347						

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UDPAR7	= 177676	#11-396								
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UIPAR0	= 177640	11-378	#11-379	321-6816	379-303	381-343	381-343			
UIPAR2	= 177644	#11-381	*67-1861	*67-1896	*169-4130	*177-4307	193-4510	263-5781	*270-5946	*369-134
UIPAR3	= 177646	#11-382	67-1882	169-4131	177-4308	369-135				
UIPAR4	= 177650	#11-383	319-6778	319-6795	*375-251					
UIPAR5	= 177652	#11-384	375-252							
UIPAR6	= 177654	#11-385	*67-1847	195-4533						
UIPAR7	= 177656	#11-386	*67-1848							
UIPDR0	= 177600	#11-358	321-6818	397-662	400-747					
UNITOP	002516	#38-1264	*75-2102	79-2167	79-2167	*96-2645	*96-2646	*96-2647	*96-2648	*96-2649
		96-2651	96-2651							
UNRELO	041604	111-2889	113-2923	115-2964	117-3005	120-3048	122-3097	124-3139	126-3188	171-4210
		#317-6718	333-7035	335-7073						
UPPFLG	002363	#38-1214	*217-4968	217-4983	*217-4985	*223-5123	225-5140	*225-5142		
UP2	056154	403-790	#403-793							
USERMA	042240	315-6698	317-6739	319-6773	#321-6815					
USESTK	- 000700	#11-258	60-1660	375-220	481-2738	481-2744				
USP	=%000006	#11-278	*60-1661	398-671	*401-761	481-2735				
WAITST	012034	83-2286	#85-2305							
WAITS	063674	433-1546	433-1563	#435-1600						
WAKEUP	054544	389-498	#391-558							
WARN1	007320	#67-1861								
WARN2	026522	#191-4465	*270-5933							
WARN3	026536	#191-4470	*270-5934							
WARN4	026562	#191-4482	*270-5935							
WARN5	026576	#191-4487	*270-5936							
WARN6	035364	#270-5946								
WARN7	024416	#169-4130								
WASDBE	- 104500	#9-240	69-1976	69-1985	69-1993	69-2001				
WASSBE	- 104476	#9-238	149-3669							
WAS1DB	- 104501	#9-241	212-4898							
WAS1SB	104477	#9-239	162-3990	162-3996	162-4003	162-4009				
WHICHC	050630	340-7188	342-7203	#363-7775						
WHOBOX	070672	466-2394	#475-2581							
WOOPEN	056512	403-802	403-805	403-807	405-821	405-842	#405-850	405-853		
WOOPS	056160	397-659	#403-795							
WOOPSA	056542	*403-800	*403-801	403-802	405-837	405-838	405-841	#405-853		
WOOPUP	056336	403-802	403-802	403-803	403-805	403-805	403-805	#405-820	405-842	405-843
		405-853								
WORST	002712	#42-1320	*47-1444	*115-2952	*117-2993	*122-3085	*126-3176	324-6907		
WRITEO	002502	#38-1258	*104-2779	*104-2782	177-4309	*367-85	*367-96	369-138	*375-227	375-255
		*375-258	*377-270	*377-276	*414-1181	*414-1183				
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ZERO	002426	#38-1233								
ZEROS	002430	#38-1234	146-3641	146-3642	248-5495	248-5499				
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$BELL	003003	#42-1353	353-7538	357-7687	459-2221					
$CACHF	037066	#285-6268	499-3504							

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SYMBOL CROSS REFERENCE CREF V01

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$CBCSR	037700	#293-6389	499-3547							
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$CDW2	075216	92-2547	92-2550	#496-3414						
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$CHK1D	040410	#300-6496	499-3556							
$CKSWR	073022	#487-2931	499-3487							
$CLRCS	040322	#300-6480	499-3553							
$CLR1C	040340	#300-6484	499-3554							
$CMTAG	002000	#38-1114	45-1416							
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$CNTLC	074224	487-2970	490-3089	#490-3140						
$CNTLG	074236	487-2958	#490-3142							
$CNTLU	074231	487-2975	490-3113	#490-3141						
$CPUOP	075162	#496-3381								
$CRLF	003010	#42-1355	96-2652	273-5972	273-5975	355-7637	407-894	462-2290	462-2313	462-2322
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$DDW0	075220	54-1548	#496-3425							
$DDW1	075222	#496-3426								
$DDW2	075224	#496-3427								
$DDW3	075226	#496-3428								
$DDW4	075230	#496-3429								
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$DDW6	075234	98-2701	98-2703	#496-3431						
$DEENE	037040	#285-6258	499-3499							
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$DEVM	075212	#496-3409								
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$ECCIN	037554	#293-6367	499-3545							
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$ECC1I	037574	#293-6372	499-3546							
$ENASB	037612	#293-6377	499-3557							
$ENA1S	037646	#293-6383	499-3558							
$ENDAD	015000	36-1087	52-1533	56-1581	#107-2816					
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$ENV	075154	52-1527	#496-3376							
$ENVM	075155	52-1520	52-1523	#496-3377						
$EOP	014662	#107-2796								
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$ERRTB	101372	462-2301	#548-4417							
$ERRTY	067324	459-2249	#462-2289							
$ERTTL	002754	#42-1337	79-2185	104-2774	107-2798	355-7620	355-7622	*459-2223	*459-2225	460-2267
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SYMBOL  VALUE   REFERENCES
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$FILLC    003002  #42-1352  407-898  542-4290
$FILLS    002451  #38-1244  *359-7706  542-4292
$GTSWR    073160  #487-2959  499-3486
$HALT     067136  #460-2254
$HALT2    075312  #497-3468
$HIBTS    075236  #496-3437
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$ITEMB    002017  #38-1125  *459-2232  462-2292
$KERNE    037020  #285-6250  499-3497
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$LOAD1    037146  288-6279  #288-6288
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                  *456-2170  460-2257
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$MADR2    075172  #496-3399
$MADR3    075176  #496-3402
$MADR4    075202  #496-3405
$MAIL     075134  #496-3366  496-3438  496-3442
$MAMS1    075164  98-2667  #496-3388
$MAMS2    075170  #496-3397
$MAMS3    075174  #496-3400
$MAMS4    075200  #496-3403
$MBADR    075240  #496-3438
$MNEW     074254  487-2961  #490-3144
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$MSGLG    075152  #496-3374
$MSGTY    075134  *460-2264  #496-3367
$MSWR     074243  487-2959  #490-3143
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$MTYP4    075201  #496-3404
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SYMBOL	VALUE	REFERENCES								
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		158-3906	158-3916	160-3927	160-3936	162-3951	165-4092	#496-3370		
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		459-2218								
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$PER02	064622	#445-1889	499-3510							
$PER03	064650	#445-1895	499-3511							
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$PER10	065004	#445-1922	499-3514							
$PER11	065034	#445-1927	499-3515							
$PER12	065054	#445-1932	499-3516							
$PER13	065076	#447-1938	499-3517							
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$PER15	065140	#447-1948	499-3519							
$PER16	065162	#447-1953	499-3520							
$PER17	065202	#447-1958	499-3521							
$PER20	065220	#447-1963	499-3522							
$PER21	065236	#447-1968	499-3523							
$PER22	065256	#447-1973	499-3524							
$PER23	065274	#447-1978	499-3525							
$PER24	065312	#447-1983	499-3526							
$PER25	054570	#393-569	499-3527							
$PER26	065502	#450-2020	499-3528							
$PER27	065522	#450-2024	499-3529							
$PER30	054762	#395-605	499-3530							
$PER31	065720	#452-2064	499-3531							
$PER32	066016	#454-2082	499-3532							
$PER33	066064	#454-2091	499-3533							
$PER34	066144	#454-2102	499-3534							
$PER35	066176	#454-2111	499-3535							
$PWRDN	055160	47-1463	#397-638	401-777						
$PWRUP	055536	398-704	#400-711	405-849						
$QUES	003007	#42-1354	487-3002	490-3121						
$RAND	074720	387-438	#493-3302							
$RDCHR	073602	#490-3053	499-3489							
$RDDEC	074436	#491-3210	499-3492							
$RDLIN	073722	#490-3080	499-3490							
$RDOCT	074266	#491-3159	499-3491							
$READC	037220	#290-6304	499-3507							
$RESRE	074662	#492-3283	499-3495							
$SAVRE	074624	#492-3272	499-3494							
$SAVR6	056140	*398-702	400-714	*400-715	*400-716	#401-784	405-832			
$SCOPE	066232	47-1457	#456-2129							
$STN	000001	#64-1689	#65-1796	#67-1833	#71-2031	#99-2710	#102-2730	#102-2740		
$SVLAD	066466	456-2156	456-2163	#456-2169						
$SWR	163000	#7-131	64-1689	65-1796	67-1833	71-2031	99-2710	102-2730	102-2740	
$SWREG	075156	52-1525	#496-3379							
$TESTN	075140	*459-2218	#496-3369							
$TKB	002774	#42-1349	273-5958	273-5994	348-7371	348-7432	351-7465	351-7475	353-7521	353-7543

SYMBOL	VALUE	REFERENCES								
		355-7594	355-7612	357-7670	357-7692	487-2936	487-2966	489-3037	490-3057	490-3063
$TKS	002772	#42-1348	273-5960	273-5993	348-7373	348-7430	351-7467	351-7473	353-7523	353-7542
		355-7596	355-7611	357-7672	357-7691	487-2934	487-2964	489-3035	490-3055	490-3061
$TN	= 000010	#7-132	64-1689	64-1689	#64-1689	65-1796	65-1796	#65-1796	67-1833	67-1833
		#67-1833	71-2031	71-2031	#71-2031	99-2710	99-2710	#99-2710	102-2730	102-2730
		#102-2730	102-2740	102-2740	#102-2740					
$TPB	003000	#42-1351	407-935							
$TPFLG	002452	#38-1245	*52-1521	407-877						
$TPS	002776	#42-1350	407-933							
$TRAP	075252	47-1461	#497-3452							
$TRAP2	075274	#497-3463	499-3478							
$TRPAD	075314	497-3457	#499-3478							
$TSTM	075242	#496-3439								
$TSTRD	037310	#290-6322	499-3559							
$TTYIN	074200	490-3082	490-3083	490-3101	490-3119	490-3133	#490-3137			
$TYPDS	072576	#486-2877	499-3483							
$TYPE	056752	#407-877	499-3479							
$TYPEC	057076	407-897	407-904	#407-907	483-2768	487-2988				
$TYPEX	057360	407-940	407-942	#407-945						
$TYPOC	072374	#485-2819	499-3480							
$TYPON	072410	485-2818	#485-2821							
$TYPOS	072350	#485-2814	499-3481							
$UNIT	075146	*107-2835	*456-2132	#496-3372						
$UNITM	075246	#496-3441								
$USWR	075160	107-2831	#496-3380							
$VECT1	075204	#496-3406								
$VECT2	075206	#496-3407								
$WASDB	040146	#298-6441	499-3551							
$WASSB	040002	#296-6406	499-3549							
$WAS1D	040262	#298-6467	499-3552							
$WAS1S	040116	#296-6432	499-3550							
$XTSTR	066370	#456-2150								
$ZAP42	014760	#107-2809	460-2271							
$OFILL	072573	*485-2815	*485-2819	485-2829	#485-2864					

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1           000000                  LSTSS 0
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```
                .TITLE  CEMKAB0 1170 MAIN MEMORY DIAG 1
                .IDENT  /X01.60/
```

IDENTIFICATION

PRODUCT CODE: AC-C644B-MC

PRODUCT NAME: CEMKAB0 1170 MAIN MEMORY DIAG

PRODUCT DATE: 31 JUL 1979

MAINTAINER: PRODUCT ENHANCEMENT

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                                REVISION HISTORY
                                ================

REVISION    VERSION      DATE            AUTHOR          CHANGES
========    =======      ========        ============    =======

  CEMKAA     V03.00     24-FEB-78       KAY R. FISHER   NONE = NEW PROGRAM

  CEMKAB     V09.00     9-OCT-78        KAY R. FISHER   1. ADD MULTIPROCESSOR CAPABILITIES
                                                        2. ADD SOFT ERROR TEST FOR ALPHA
                                                           PARTICLES IN MOS CHIPS
                                                        3. ADD THE FOLLOWING
                                                           FIELD SERVICE COMMANDS
                                                           A. KAMIKAZE MODE
                                                           B. CACHE ON/OFF
                                                           C. SELECT ONLY MULTIPORT TESTS
                                                           D. TEST ONLY SELECTED BANKS
                                                        4. EXPAND DETAILED ERROR REPORT
                                                           TO INCLUDE
                                                           ALL CSR'S AND SP AT TIME OF ERROR
                                                        5. SPEED UP GALLOPING PATTERN
                                                           BY EXECUTING OUT OF THE PAR'S
                                                        6. OPTIMIZE THE SHIFTING DIAGONAL
                                                           PATTERN BY SHARING CODE WITH
                                                           THE REFRESH PATTERN
                                                        7. ADD BRANCH GOBBLE PATTERN
                                                        8. ADD WRITE RECOVERY PATTERN
                                                        9. REPAIRED THE FOLLOWING BUGS
                                                           A. UNDER APT FIELD SERVICE
                                                              COMMANDS 1 & 2
                                                           B. UNDER APT USE OF ENVIRONMENTAL
                                                              MODE DID NOT MEET APT SPEC
                                                            . FATAL PARITY ERRORS
                                                              AT LOAD TIME THAT WERE
                                                              CAUSED BY .BLKW STATEMENTS
                                                           D. RESTART AT 202 CLEARS
                                                              ERROR ACCOUNTING
                                                           E. INTERMITTANT SINGLE BIT
                                                              ERRORS IN CHECKBITS NOT DETECT
                                                           F. ERROR COUNT WAS MOD 32K
                                                           G. ODT HANGS AFTER 256 OPENS
                                                           H. WRONG PC PRINTED ON SOME ERROR
                                                           I. HIADRS LOADRS REG'S NOT CLEARE
                                                              AFTER SIZING
                                                           J. ACT MEMORY SIZE DEPENDENT
                                                              BIT DEFINED WRONG
                                                           K. UNABLE TO RUN WITHOUT
                                                              A LINE CLOCK
```

```
                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        .SBTTL ;SWITCH REGISTER DEFINITIONS
                        .SBTTL ;*
                        .SBTTL ;*       SWITCH                  USE
                        .SBTTL ;*       ------          --------------------
                        .SBTTL ;*         15            HALT ON ERROR
                        .SBTTL ;*         14            LOOP ON TEST
                        .SBTTL ;*         13            INHIBIT ERROR TYPEOUTS
                        .SBTTL ;*         12            INHIBIT RELOCATION
                        .SBTTL ;*         11            QUICK VERIFY / INHIBIT MARGIN TESTING
                        .SBTTL ;*         10            BELL ON ERROR
                        .SBTTL ;*          9            LOOP ON ERROR
                        .SBTTL ;*          8            HALT PROGRAM (UNRELOCATED & RESTORE LOADERS)
                        .SBTTL ;*          7            DETAILED ERROR REPORTS
                        .SBTTL ;*          6            PRINT CONFIGURATION MAP
                        .SBTTL ;*          5            LIMIT MAX ERRORS PER BANK
                        .SBTTL ;*          4            FAT TERMINAL (132 COLUMNS OR BETTER)
                        .SBTTL ;*          3            TEST MODE - SEE DOCUMENT
                        .SBTTL ;*          2            TEST MODE - SEE DOCUMENT
                        .SBTTL ;*          1            TEST MODE - SEE DOCUMENT
                        .SBTTL ;*          0            DETECT SINGLE BIT ERRORS
```

```
                                .ENABL  ABS
                                .ENABL  AMA
                                .DSABL  GBL
                                ;NOTE:  CEMKAB.SML IS THE SUPER.MAC SOURCE AND IS RELEASED WITH
                                ;THIS PROGRAM.  ALL THESE .MCALL STATEMENTS REFERENCE THAT FILE.
                                .MCALL  SMACIT,..PUSH,..POP,..TAG,..BRAN,.EMIT,.EMITN,.EMITL,.EMITR
                                .MCALL  .IFOPR,.IS,.GENBR,.OPADD,.OPSUB,CLEAR,SET,CLEARB,SETB
                                .MCALL  RNE,REQ,RLT,RGE,RGT,RLE,RPL,RMI,RHI,RLOS,RHIS,RLO,RCS,RCC
                                .MCALL  IF,.OR,.IFARI,.LEAVE,.GOTO,OR,AND,THEN,ELSE,WHILE,CASE
                                .MCALL  FOR,TO,DOWNTO,REPEAT,UNTIL,THRU,END,BEGIN
                                .MCALL  $$END,LEAVE,JUMPTO,GOTO,PUSH,POP,LET
                                .MCALL  .SIMPLE,.ARITH,ORB,ANDB,IFB,UNTILB,WHILEB,ON.ERROR,ON.NOERROR
                                .MCALL  $CALL,$RETURN

                                .NLIST  TTM                     ;I WANT FAT PAPER!
                                .LIST   MC,SYM                  ;LIST MACRO CALLS, SYMBOL TABLE
                                .NLIST  MD,CND,ME               ;DON'T LIST MACRO DEFS & CONDITIONALS & EXPANSIONS
                                ;LST$$- 0                       ;DEFINED TO LIST SUPERMAC EXPANSIONS
        163000                  $SWR=   163000                  ;USE THESE SYSMAC SWITCHES
        000001                  $TN=    1                       ;FIRST TEST NUMBER TO ONE(1)
000000                          SMACIT
```

```
                                .SBTTL  DEFINE  TRAPS
                        ;ALL ENTRIES HERE MUST HAVE A CORRESPONDING ENTRY IN THE
                        ;TRAP TABLE "$TRPAD" (NEAR END OF PROGRAM).
                        ;*TRAP DEFINITIONS
                        ;
                        ;HERE IS HOW TRAPS WORK IN THIS PROGRAM
                        ;
                        ;ALL TRAPS EXECUTE A "TRAP" INSTRUCTION WHICH TAKES THE PROGRAM
                        ;TO SYMBOLIC LOCATION "$TRAP"
                        ;
                        ;AT $TRAP THE PROGRAM PICKS UP THE RIGHT BYTE OF THE TRAP INSTRUCTION
                        ;AND INDEXES INTO A TABLE AT LOCATION "$TRPAD" WHICH SENDS THE PROGRAM TO
                        ;THE SPECIFIC ROUTINE TO HANDLE THAT SPECIFIC TRAPS TASK.
                        ;
                        ;THE ULTIMATE DESTINATION OF A TRAP INSTRUCTION CAN BE GUESSED AT AS FOLLOWS
                        ;
                        ;EXAMPLE:       NOP
                        ;               NOP
                        ;               NOP
                        ;               KERNEL                  ;ENTER KERNEL MODE
                        ;               NOP
                        ;
                        ;       ADD A DOLLAR SIGN TO THE SYMBOLIC NAME AND CHECK THE CRF FOR SOMETHING CLOSE
                        ;       IS THIS CASE THE CRF HAS $KERNE LISTED AS 032546
                        ;       AT LOCATION 32546 YOU FIND THE ROUTINE $KERNEL
                        ;
                        ;       NOTE THAT CRF SYMBOLS ARE TRUCNATED TO 6 CHARACTERS
                        ;       SYMBOLIC NAMES GREATER THAT 6 CHARACTERS ARE USED SO I CAN
                        ;       REMEMBER WHAT THEY MEAN!
                        ;
                        ;       ALL GOOD TRAP ROUTINES RETURN VIA AN "RTI" INSTRUCTION
104401                  TYPEIT= 104401          ;;TTY TYPEOUT ROUTINE
104402                  TYPOC=  104402          ;;TYPE OCTAL NUMBER (WITH LEADING ZEROS)
104403                  TYPOS=  104403          ;;TYPE OCTAL NUMBER (NO LEADING ZEROS)
                        ;TYPON= 104404          ;;TYPE OCTAL NUMBER (AS PER LAST CALL)
104405                  TYPDS=  104405          ;;TYPE DECIMAL NUMBER (WITH SIGN)
                        ;TYPBN= 104406          ;;TYPE BINARY (ASCII) NUMBER

104407                  GTSWR=  104407          ;;GET SOFT-SWR SETTING
104410                  CKSWR-  104410          ;;TEST FOR CHANGE IN SOFT-SWR

104411                  RDCHR=  104411          ;;TTY TYPEIN CHARACTER ROUTINE
104412                  RDLIN=  104412          ;;TTY TYPEIN STRING ROUTINE
104413                  RDOCT=  104413          ;;READ AN OCTAL NUMBER FROM TTY
104414                  RDDEC-  104414          ;;READ A DECIMAL NUMBER FROM TTY

104415                  SAVREG- 104415          ;;SAVE R0-R5 ROUTINE
104416                  RESREG= 104416          ;;RESTORE R0-R5 ROUTINE

104417                  KERNEL= 104417          ;ENTER KERNEL MODE

104420                  ENERGIZE 104420         ;TURN ON MEMORY MANAGEMENT & TRAPS
104421                  DEENERGIZE 104421       ;TURN OFF MEMORY MANAGEMENT & TRAPS

104422                  KMAP    104422          ;MAP KERNEL 1 TO 1

104423                  CACHON  104423          ;TURN ON CACHE
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193          104424                  CACHOFF=104424          ;TURN OFF CACHE
194
195          104425                  LOADCSR=104425          ;LOAD CORRECT CSR
196          104426                  READCSR=104426          ;READ CORRECT CSR
197
198          104427                  PERR01= 104427          ;PROGRAM DETECTED ERROR
199          104430                  PERR02= 104430          ;PROGRAM DETECTED ERROR
200          104431                  PERR03= 104431          ;PROGRAM DETECTED ERROR
201          104432                  PERR04= 104432          ;PROGRAM DETECTED ERROR
202          104433                  PERR07= 104433          ;PROGRAM DETECTED ERROR
203          104434                  PERR10= 104434          ;PROGRAM DETECTED ERROR
204          104435                  PERR11= 104435          ;PROGRAM DETECTED ERROR
205          104436                  PERR12= 104436          ;PROGRAM DETECTED ERROR
206          104437                  PERR13= 104437          ;PROGRAM DETECTED ERROR
207          104440                  PERR14= 104440          ;PROGRAM DETECTED ERROR
208          104441                  PERR15= 104441          ;PROGRAM DETECTED ERROR
209          104442                  PERR16= 104442          ;PROGRAM DETECTED ERROR
210          104443                  PERR17= 104443          ;PROGRAM DETECTED ERROR
211          104444                  PERR20= 104444          ;PROGRAM DETECTED ERROR
212          104445                  PERR21= 104445          ;PROGRAM DETECTED ERROR
213          104446                  PERR22= 104446          ;PROGRAM DETECTED ERROR
214          104447                  PERR23= 104447          ;PROGRAM DETECTED ERROR
215          104450                  PERR24= 104450          ;PROGRAM DETECTED ERROR
216          104451                  PERR25= 104451          ;PROGRAM DETECTED ERROR
217          104452                  PERR26= 104452          ;PROGRAM DETECTED ERROR
218          104453                  PERR27= 104453          ;PROGRAM DETECTED ERROR
219          104454                  PERR30= 104454          ;PROGRAM DETECTED ERROR
220          104455                  PERR31= 104455          ;PROGRAM DETECTED ERROR
221          104456                  PERR32= 104456          ;PROGRAM DETECTED ERROR
222          104457                  PERR33= 104457          ;PROGRAM DETECTED ERROR
223          104460                  PERR34= 104460          ;PROGRAM DETECTED ERROR
224          104461                  PERR35= 104461          ;PROGRAM DETECTED ERROR
225          104462                  PERR36= 104462          ;PROGRAM DETECTED ERROR
226          104463                  PERR37= 104463          ;PROGRAM DETECTED ERROR
227          104464                  PERR40= 104464          ;PROGRAM DETECTED ERROR
228          104465                  PERR41= 104465          ;PROGRAM DETECTED ERROR
229          104466                  PERR42= 104466          ;PROGRAM DETECTED ERROR
230          104467                  PERR43= 104467          ;PROGRAM DETECTED ERROR
231
232          104470                  ECCDIS= 104470          ;DISABLE ECC ON ALL CSR'S
233          104471                  ECC1DIS=104471          ;DISABLE ECC ON 1 SELECTED CSR
234          104472                  ECCINIT=104472          ;INITIALIZE ALL MK11 CSR'S
235          104473                  ECC1INIT=104473         ;INITIALIZE 1 SELECTED MK11 CSR
236          104474                  CBCSR=  104474          ;WRITE GENERATED CHECKBITS IN ALL CSR'S
237          104475                  CB1CSR= 104475          ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
238          104476                  WASSBE= 104476          ;WAS THERE A SBE ON ANY CSR?
239          104477                  WAS1SBE=104477          ;WAS THERE A SBE ON 1 SELECTED CSR?
240          104500                  WASDBE= 104500          ;WAS THERE A DBE ON ANY CSR?
241          104501                  WAS1DBE=104501          ;WAS THERE A DBE ON 1 SELECTED CSR?
242          104502                  CLRCSR= 104502          ;CLEAR ALL CSR'S
243          104503                  CLR1CSR=104503          ;CLEAR 1 SELECTED CSR
244          104504                  CHKDIS= 104504          ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
245          104505                  CHK1DIS=104505          ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
246          104506                  ENASBE= 104506          ;ENABLE TRAPS ON SBE'S FROM ALL CSR'S
247          104507                  ENA1SBE=104507          ;ENABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
248           04510                  TSTREAD=104510          ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
249          104511                  INVALID=104511          ;INVALIDATE BACKGROUND PATTERN ON 'BANK''
```

```
                                .SBTTL  DEFINE  BASIC PDP11 STUFF

                        ;*INITIAL ADDRESS OF THE STACK POINTER
002000                  STACK=  2000            ;;FIRST ADDRESS OF THE STACK
002000                  KERSTK= STACK           ;;KERNEL STACK
000740                  SUPSTK= 740             ;;SUPERVISOR STACK
000700                  USESTK= 700             ;;USER STACK
104000                  ERROR=EMT               ;;BASIC DEFINITION OF ERROR CALL
000004                  SCOPE=IOT               ;;BASIC DEFINITION OF SCOPE CALL
177776                  PSW=    177776          ;;PROCESSOR STATUS WORD
                        ;STKLMT=177774          ;;STACK LIMIT REGISTER
                        ;PIRQ=  177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
177546                  LKS=    177546          ;;LINE CLOCK (KW11-L) STATUS REGISTER

                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE LINE FEED
000015                  CR=     15              ;;CODE CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED

                        ;*GENERAL PURPOSE REGISTER DEFINITIONS
                        ;SP=R6                  ;;STACK POINTER
                        ;KSP=SP                 ;;KERNEL STACK POINTER
000006                  SSP=SP                  ;;SUPERVISOR STACK POINTER
000006                  USP=SP                  ;;USER STACK POINTER
                        ;PC=R7                  ;;PROGRAM COUNTER

                        ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
100000                  SW15=   100000
040000                  SW14=   40000
020000                  SW13=   20000
010000                  SW12=   10000
004000                  SW11=   4000
002000                  SW10=   2000
001000                  SW9=    1000
000400                  SW8=    400
000200                  SW7=    200
000100                  SW6=    100
000040                  SW5=    40
000020                  SW4=    20
000010                  SW3=    10
000004                  SW2=    4
000002                  SW1=    2
000001                  SW0=    1

                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT9=   1000
000400                  BIT8=   400
000200                  BIT7=   200
```

```
                        BIT6=   100
                        BIT5=   40
                        BIT4=   20
                        BIT3=   10
                        BIT2=   4
                        BIT1=   2
                        BIT0=   1

                        ;*BASIC ''CPU'' TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
                        ;TBITVEC-14             ;;''T'' BIT
                        ;TRTVEC=        14              ;;TRACE TRAP
                        ;BPTVEC=        14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;''TRAP'' TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
                        ;TPVEC= 64              ;;TTY PRINTER VECTOR
                        ;LKVEC= 100             ;;LINE CLOCK (KW11-L) VECTER
000114                  CACHVEC=114             ;;CACHE ERROR INTERRUPT VECTOR
000114                  PARVEC=CACHVEC
                        ;PIRQVEC=240            ;;PROGRAM INTERRUPT REQUEST VECTOR
000250                  MMVEC=  250             ;;MEMORY MANAGEMENT VECTOR
                                .SBTTL  DEFINE  CACHE REGISTERS
177740                  LOADRS = 177740         ;;LOWER 16 BITS OF ADDRESS THAT CAUSED ERROR
177742                  HIADRS = 177742         ;;UPPER SIX BITS OF ADDRESS THAT CAUSED ERROR
177744                  MEMERR = 177744         ;;CACHE ERROR REGISTER
177746                  CONTRL = 177746         ;;MEMORY CONTROL REGISTER
177750                  MAINT  = 177750         ;;MEMORY MAINTENENCE REGISTER
                        ;HITMIS - 177752                ;;HIT MISS REGISTER ''1'' IMPLIES HIT IN CACHE

                                .SBTTL  DEFINE  CPU REGISTERS
177760                  SIZELO - 177760         ;;MEMORY SIZE REGISTER NUMBER TO PUT INTO A PAR
                                                ;;TO GET TO THE LAST 32 WORDS OF MEMORY
                        ;SIZEHI = 177762                ;;HIGH SIZE REGISTER, RESERVED FOR FUTURE USE
                                                ;;CURRENTLY ALL ZERO
177764                  SYSTID = 177764         ;;SYSTEM ID REGISTER
177766                  CPUERR - 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED

                                .SBTTL  DEFINE  MEMORY MANAGEMENT REGISTERS
                                ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES
177572                  MMR0-   177572
177574                  MMR1=   177574
177576                  MMR2=   177576
172516                  MMR3=   172516

                                ;*USER ''I'' PAGE DESCRIPTOR REGISTERS
177600                  UIPDR0- 177600
                        ;UIPDR1=        177602
                        ;UIPDR2=        177604
                        ;UIPDR3=        177606
                        ;UIPDR4=        177610
                        ;UIPDR5=        177612
                        ;UIPDR6=        177614
                        ;UIPDR7=        177616
```

```
                                ;*USER 'D'' PAGE DESCRIPTOR REGISTORS
                        ;UDPDR0         177620
                        ;UDPDR1=        177622
                        ;UDPDR2=        177624
                        ;UDPDR3=        177626
                        ;UDPDR4=        177630
                        ;UDPDR5=        177632
                        ;UDPDR6=        177634
177636                  UDPDR7= 177636

                                ;*USER ''I'' PAGE ADDRESS REGISTERS
177640                  FASTCITY=UIPAR0
177640                  UIPAR0= 177640          ;PATTERN PROGRAM SPACE
                        ;UIPAR1=        177642          ;PATTERN PROGRAM SPACE
177644                  UIPAR2= 177644          ;PATTERN PROGRAM SPACE
177646                  UIPAR3= 177646          ;PATTERN PROGRAM SPACE
177650                  UIPAR4= 177650          ;PATTERN PROGRAM SPACE
177652                  UIPAR5= 177652          ;PATTERN PROGRAM SPACE
177654                  UIPAR6= 177654          ;PATTERN PROGRAM SPACE
177656                  UIPAR7= 177656          ;PATTERN PROGRAM SPACE

                                ;*USER 'D'' PAGE ADDRESS REGISTERS
177660                  UDPAR0= 177660          ;PATTERN PROGRAM SPACE
177662                  UDPAR1= 177662          ;PATTERN PROGRAM SPACE
                        ;UDPAR2=        177664          ;PATTERN PROGRAM SPACE
                        ;UDPAR3=        177666          ;PATTERN PROGRAM SPACE
                        ;UDPAR4=        177670          ;PATTERN PROGRAM SPACE
                        ;UDPAR5=        177672          ;PATTERN PROGRAM SPACE
                        ;UDPAR6=        177674          ;PATTERN PROGRAM SPACE
177676                  UDPAR7= 177676          ;PATTERN PROGRAM SPACE

                                ;*SUPERVISOR ''I'' PAGE DESCRIPTOR REGISTERS
172200                  SIPDR0= 172200
                        ;SIPDR1=        172202
                        ;SIPDR2=        172204
                        ;SIPDR3=        172206
                        ;SIPDR4=        172210
                        ;SIPDR5=        172212
                        ;SIPDR6=        172214
                        ;SIPDR7=        172216

                                ;*SUPERVISOR 'D'' PAGE DESCRIPTOR REGISTERS
                        ;SDPDR0=        172220
                        ;SDPDR1=        172222
                        ;SDPDR2=        172224
                        ;SDPDR3=        172226
                        ;SDPDR4=        172230
                        ;SDPDR5=        172232
                        ;SDPDR6=        172234
172236                  SDPDR7= 172236

                                ;*SUPERVISOR ''I'' PAGE ADDRESS REGISTERS
172240                  SIPAR0= 172240
                        ;SIPAR1=        172242
                        ;SIPAR2=        172244
172246                  SIPAR3= 172246          ;TEST AREA
```

```
                                ;SIPAR4=        172250          ;TEST AREA
                                ;SIPAR5=        172252          ;TEST AREA
                                ;SIPAR6=        172254          ;TEST AREA
                                ;SIPAR7=        172256

                                        ;*SUPERVISOR 'D' PAGE ADDRESS REGISTERS
        172260                  SDPAR0= 172260
                                ;SDPAR1=        172262
                                ;SDPAR2=        172264
                                ;SDPAR3=        172266
                                ;SDPAR4=        172270
                                ;SDPAR5=        172272
                                ;SDPAR6=        172274
        172276                  SDPAR7= 172276

                                        ;*KERNEL 'I' PAGE DESCRIPTOR REGISTERS
        172300                  KIPDR0= 172300
                                ;KIPDR1=        172302
                                ;KIPDR2=        172304
                                ;KIPDR3=        172306
                                ;KIPDR4=        172310
                                ;KIPDR5=        172312
                                ;KIPDR6=        172314
                                ;KIPDR7=        172316

                                        ;*KERNEL 'D' PAGE DESCRIPTOR REGISTERS
                                ;KDPDR0=        172320
                                ;KDPDR1=        172322
                                ;KDPDR2=        172324
                                ;KDPDR3=        172326
                                ;KDPDR4=        172330
                                ;KDPDR5=        172332
                                ;KDPDR6=        172334
        172336                  KDPDR7= 172336

                                        ;*KERNEL 'I' PAGE ADDRESS REGISTERS
        172340                  KIPAR0= 172340
                                ;KIPAR1=        172342
                                ;KIPAR2=        172344
                                ;KIPAR3=        172346
        172350                  KIPAR4= 172350
        172352                  KIPAR5= 172352
        172354                  KIPAR6= 172354
        172356                  KIPAR7= 172356

                                        ;*KERNEL 'D' PAGE ADDRESS REGISTERS
        172360                  KDPAR0= 172360
                                ;KDPAR1=        172362
                                ;KDPAR2=        172364
                                ;KDPAR3=        172366
                                ;KDPAR4=        172370
                                ;KDPAR5         172372
                                ;KDPAR6=        172374
        172376                  KDPAR7  172376
```

```
                                .SBTTL  DEFINE  UNIBUS MAP REGISTERS
                                ;*THE LOWER 16 BITS OF THE MAP REGISTERS ARE LABELED 'MAPLXX'
                                ;*THE UPPER 6 BITS OF THE MAP REGISTERS ARE LABELED 'MAPHXX'
170200                  MAPL0 = 170200
170202                  MAPH0 = 170202
170204                  MAPL1 = 170204
                        ;MAPH1 = 170206
                        ;MAPL2 = 170210
                        ;MAPH2 = 170212
                        ;MAPL3 = 170214
                        ;MAPH3 = 170216
                        ;MAPL4 = 170220
                        ;MAPH4 = 170222
                        ;MAPL5 = 170224
                        ;MAPH5 = 170226
                        ;MAPL6 = 170230
                        ;MAPH6 = 170232
                        ;MAPL7 = 170234
                        ;MAPH7 = 170236
                        ;MAPL10 = 170240
                        ;MAPH10 = 170242
                        ;MAPL11 = 170244
                        ;MAPH11 = 170246
                        ;MAPL12 = 170250
                        ;MAPH12 = 170252
                        ;MAPL13 = 170254
                        ;MAPH13 = 170256
                        ;MAPL14 = 170260
                        ;MAPH14 = 170262
                        ;MAPL15 = 170264
                        ;MAPH15 = 170266
                        ;MAPL16 = 170270
                        ;MAPH16 = 170272
                        ;MAPL17 = 170274
                        ;MAPH17 = 170276
                        ;MAPL20 = 170300
                        ;MAPH20 = 170302
                        ;MAPL21 = 170304
                        ;MAPH21 = 170306
                        ;MAPL22 = 170310
                        ;MAPH22 = 170312
                        ;MAPL23 = 170314
                        ;MAPH23 = 170316
                        ;MAPL24 = 170320
                        ;MAPH24 = 170320
                        ;MAPL25 = 170324
                        ;MAPH25 = 170326
                        ;MAPL26 = 170330
                        ;MAPH26 = 170332
                        ;MAPL27 = 170334
                        ;MAPH27 = 170336
                        ;MAPL30 = 170340
                        ;MAPH30 = 170342
                        ;MAPL31 = 170344
                        ;MAPH31 = 170346
                        ;MAPL32 = 170350
                        ;MAPH32 = 170352
```

```
                                ;MAPL33 = 170354
                                ;MAPH33 - 170356
                                ;MAPL34 = 170360
                                ;MAPH34 = 170362
                                ;MAPL35 = 170364
                                ;MAPH35 = 170366
170370                          MAPL36 = 170370
170372                          MAPH36 = 170372
                                ;MAPL37 = 170374
170376                          MAPH37 = 170376

                                        .SBTTL  DEFINE  SOFTWARE SWITCH & DISPLAY REGISTERS
000174                          DISPREG=174
000176                          SWREG=  176

                                        .SBTTL  DEFINE  MK11 REGISTERS
172100                          MK11ADD-172100

                                        .SBTTL  DEFINE  PARAMETERS
060000                          FIRST=60000                     ;START OF THE 16K TEST PATTERN AREA
157776                          LAST=157776                     ;END OF THE 16K TEST PATTERN AREA
040000                          SIZE=40000                      ;SIZE OF THE 16K TEST PATTERN AREA (FOR SOB INSTRUCTIONS)
011661                          SECONDS=11661                   ;CONSTANT FOR LENGTH OF TIME FOR HUNG CPU TEST
                                        .SBTTL  DEFINE MASTER & SLAVE BITS
000020                          MASTER=20
000040                          SLAVE1-40
000100                          SLAVE2-100
000200                          SLAVE3=200
```

```
                        .LIST   MD                      ;BE NICE TO SEE MY DEFINITIONS
                        .SBTTL  MACRO   FATAL
                ;********************* FATAL ************************
                ;
                ;FATAL IS USED TO REPORT FATAL ERRORS (ERRORS THAT PREVENT
                ;       THE PROGRAM FROM CONTINUING).
                ;
                ;*****************************************************
                        .MACRO  FATAL   ARG             ;***MACRO***MACRO***MACRO***
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        INC     FATAL$                  ;SET FATAL INDICATOR
                        ERROR   +ARG
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   FATAL

                        .SBTTL  MACRO   TYPE
                        .MACRO  TYPE    ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        .IF B ARG
                        TYPEIT
                        .IFF
                        TYPEIT  ,ARG
                        .ENDC
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPE
```

```
                        .SBTTL  MACRO   NEWTST
                ;********************* NEWTST *********************
                ;NEWTST IS USED AS THE FIRST INSTRUCTION OF A TEST.
                ;IT WILL:
                ;1)  GENERATE A TEST NUMBER FOR THE LABEL OF THIS TEST
                ;2)  PUT STARS BEFORE AND AFTER A MESSAGE
                ;ARGUMENTS
                ;1)  ASCII  --  THIS IS THE MESSAGE THAT WILL APPEAR
                ;               ON THE LISTING
                ;2)  ICOUNT --  IF NON-BLANK AND BIT 11 OF $SWR = 1 IT WILL BE
                ;               THE NUMBER OF ITERATIONS TO MAKE ON THIS TEST
                ;3)  RETURN --  IF NON-BLANK WILL BE THE ADDRESS TO
                ;               WHICH THE NEXT SCOPE STATEMENT WILL
                ;               LOOP BACK TO.
                ;4)  COMAND --  IF NON-BLANK WILL BE THE FIRST
                ;               INSTRUCTION OF THE TEST
                ;               IF BLANK SCOPE WILL BE THE
                ;               FIRST INSTRUCTION
                ;*************************************************
                        .MACRO  NEWTST  ASCII,ICOUNT,RETURN,COMAND
                        $STN=1
                        $NWTST=0
                        .NLIST  MC
                        .IF B <COMAND>
                        $$NEWTEST       \$TN,<ASCII>,SCOPE
                        .IFF
                        $$NEWTEST       \$TN,<ASCII>,<COMAND>
                        .ENDC
                        .NLIST
                        .LIST   ME
                        .LIST
                        .IF NE 4000&$SWR
                        .IF NB ICOUNT
                        .IF LE <ICOUNT-1>
                        MOV     #1,$TIMES       ;;DO 1 ITERATION
                        .IFF
                        MOV     #ICOUNT,$TIMES  ;;DO ICOUNT ITERATIONS
                        .ENDC
                        .ENDC
                        .IF NB RETURN
                        MOV     #RETURN,$LPADR  ;;SET SCOPE LOOP ADDRESS
                        .ENDC
                        .ENDC
                        .NLIST
                        .LIST   MC
                        .LIST
                        .NLIST  ME
                        .ENDM   NEWTST
```

```
                        .SBTTL  MACRO   $$NEWTEST
                        .MACRO  $$NEWTEST       A,ASC,COMND
                         'RP    ASCI,<ASC>
                        .IF EQ $NWTST
                        $NWTST=1
                        .SBTTL  T'A'    ASCI
                        .NLIST
                        .LIST   ME
                        .LIST
                ;*******************************************************************************
                ;*TEST A         ASCI
                        .IFF
                        ASCI
                        .ENDC
                        .ENDM
                ;*******************************************************************************
                TST'A:  COMND
                        .NLIST  ME
                        $TN=$TN+1
                        .ENDM   $$NEWTEST

                        .SBTTL  MACRO   SUBTST
                ;************** SUBTST ******************************
                ;
                ;THIS MACRO WILL FORMAT A SUBTEST HEADING WITH STARS
                ;A .SBTTL WILL BE FORCED & .NLISTED FOR THE TABLE OF CONTENTS.
                ;
                ;ARGUMENT:
                ;1) TXT --      THIS IS THE MESSAGE THAT WILL APPEAP IN THE TABLE OF CONTENTS & LISTING.
                ;
                ;EXAMPLE:       SUBTST  <<THIS IS A FUN SUBTST>>
                ;
                ;************************************************************

                        .MACRO  SUBTST  ASCII
                        .NLIST  MC
                        $SUBTST <ASCII>
                        .LIST   MC
                        .ENDM   SUBTST

                        .SBTTL  MACRO   $SUBTST
                        .MACRO  $SUBTST ASC
                        .IRP    ASCI,<ASC>
                        .SBTTL  ASCI
                        .NLIST
                        .LIST   ME
                        .LIST
                ;*******************************************************************************
                ;*SUBTEST        ASCI
                        .ENDM
                ;************************************************************ ***********************
                        .NLIST  ME
                        .ENDM   $SUBTST
```

```
                        .SBTTL  MACRO   TYPOCT
                ;******************** TYPOCT ********************
                ;
                ;TYPOCT IS USED TO CHANGE A BINARY NUMBER
                ;       TO A 6 DIGIT OCTAL NUMBER AND TYPE IT
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     THE NUMBER TO BE TYPED
                ;
                ;2)     REMARK  ALLOWS A COMMENT TO BE MADE
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO OCTAL AND TYPE (.$TYPOCT)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES:
                ;
                ;1)     TYPOCT  HILMT,<TYPES THE CONTENTS OF HILMT>
                ;2)     TYPOCT  #5,<TYPES ' 000005'>
                ;
                ;*****************************************************************

                        .MACRO  TYPOCT  NUM,REMARK
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                        .IIF NB <REMARK>,                               ;;REMARK
                        TYPOC                   ,;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPOCT
```

```
                        .SBTTL  MACRO   TYPOCS
                ;******************** TYPOCS ********************
                ;
                ;TYPOCS IS USED TO CHANGE A BINARY NUMBER TO AN OCTAL
                ;       NUMBER AND TYPE 1 TO 6 DIGITS
                ;       WITH OR WITHOUT LEADING ZEROS.
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     NUMBER TO BE TYPED
                ;
                ;2)     REMARK  ALLOWS A COMMENT TO BE MADE
                ;
                ;3)     N       NUMBER OF DIGITS (1 TO 6) TO BE TYPED
                ;
                ;4)     Z       BLANK=SUPPRESS LEADING ZEROS (TYPES SPACES)
                ;               NON-BLANK-TYPE LEADING ZEROS
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO OCTAL AND TYPE (.$TYPOCT)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES:
                ;1)     TYPOCS  #12345,<TYPES '5'>,1
                ;2)     TYPOCS  #004,<TYPES '04'>,2,X
                ;3)     TYPOCS  #004,<TYPES ' 4'>,2
                ;
                ;*****************************************************************

                        .MACRO  TYPOCS  NUM,REMARK,N,Z
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                        .IIF NB <REMARK>,                       ;;REMARK
                        TYPOS                   ;;GO TYPE--OCTAL ASCII
                        .IF NB N
                        .BYTE   N               ;;TYPE N DIGIT(S)
                        .IFF
                        .BYTE   6               ;;TYPE 6 DIGITS
                        .ENDC
                        .IF NB Z
                        .BYTE   1               ;;TYPE LEADING ZEROS
                        .IFF
                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
                        .ENDC
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPOCS
```

```
                        .SBTTL  MACRO   TYPDEC
                ;******************** TYPDEC ********************
                ;
                ;TYPDEC IS USE TO CHANGE A BINARY NUMBER TO A SIGNED
                ;       DECIMAL NUMBER AND TYPE IT REPLACING LEADING ZERO
                ;       WITH SPACES.
                ;NOTE:  IF THE NUMBER IS NEGATIVE A
                ;       MUNUS SIGN WILL BE TYPED.
                ;
                ;ARGUMENTS:
                ;
                ;1)     NUM     NUMBER TO BE TYPED
                ;
                ;2)     REMARK ALLOWS A COMMENT TO BE MADE
                ;
                ;ROUTINES REQUIRED
                ;
                ;1)     CONVERT BINARY TO DECIMAL AND TYPE (.$TYPDEC)
                ;
                ;2)     TYPE AN ASCIZ STRING (.$TYPE)
                ;
                ;EXAMPLES
                ;
                ;1)     TYPDEC  SIZE,<TYPE THE CONTENTS OF SIZE>
                ;2)     TYPDEC  #-10.,<TYPE A MINUS TEN>
                ;
                ;*****************************************************************

                        .MACRO  TYPDEC  NUM,REMARK
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     NUM,-(SP)       ;;SAVE NUM FOR TYPEOUT
                        .IIF NB <REMARK>,                       ;;REMARK
                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   TYPDEC
```

```
                        .SBTTL  MACRO   BMOV
                ;*************** BMOV ************************
                ;
                ; THIS MACRO MOVES A BLOCK OF DATA.
                ;
                ;ARGUEMENTS:
                ;
                ;1)     FROMHERE        THE FIRST ADDRESS OF THE SOURCE BLOCK.
                ;
                ;2)     TOHERE          THE FIRST ADDRESS OF THE DESTINATION BLOCK.
                ;                       IF BLANK THE 1ST ADDRESS OF THE USER INSTRUCTION
                ;                       PAR'S IS USED (FASTCITY).
                ;
                ;3)     SIZE            THE SIZE OF THE SOURCE BLOCK.
                ;                       IF BLANK A 16 WORD TRANSFER IS ASSUMED.
                ;                       ''WHY DEFAULT TO 16 WORDS?'' YOU ASK.
                ;                       ''BECAUSE THAT'S HOW MANY WORDS TO THE USER PAR
                ;                       REGISTERS & THAT'S WHERE I INTEND TO MOVE LOTS
                ;                       OF STUFF.'' I REPLY!
                ;
                ;*********************************************

                .MACRO  BMOV    FROMHERE,TOHERE,SIZE
                  .IF B TOHERE
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK1
                    FROMHERE
                    .DSABL      CRF
                    .IIF DF LST$$ .NLIST  ME
                    .ENABL      CRF
                    .MEXIT
                  .ENDC
                  .IF B SIZE
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK2
                    TOHERE
                    FROMHERE
                    .DSABL      CRF
                    .IIF DF LST$$ .NLIST  ME
                    .ENABL      CRF
                    .MEXIT
                  .IFF
                    .NLIST
                    .DSABL      CRF
                    .IIF DF LST$$ .LIST  ME
                    .ENABL      CRF
                    .LIST
                    JSR R5,BLOCK3
                    SIZE
```

```
                        TOHERE
                        FROMHERE
                        .DSABL      CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL      CRF
                    .ENDC
                .ENDM   BMOV
```

```
                        .SBTTL  MACRO   MAP
                ;****************** MAP ****************************
                ;
                ; THIS MACRO MAPS A MEMORY BANK (16K) INTO THE
                ; TEST PATTERN AREA (SUPERVISOR VIRTUAL (60000-157777)).
                ;
                ;ARGUEMENTS:
                ;
                ;1)     BANK    THE BANK OF 16K WORDS TO BE MAPPED.
                ;               THERE ARE 120 BANKS OF 16K WORDS
                ;
                ;EXAMPLES
                ;
                ;       MAP     LOC             ;LOCATION 'LOC'' CONTAINS THE # OF THE BANK TO MAP
                ;
                ;       MAP     #28.            ;BANK 34 (OC'AL) WILL BE MAPPED
                ;
                ;***************************************************
                ;
                .MACRO  MAP     BANK
                PUSH    R3
                .NLIST
                .DSABL  CRF
                .IIF DF LST$$ .LIST  ME
                .ENABL  CRF
                .LIST
                .IF B BANK
                MOV     #120.,R3
                .IFF
                MOV     BANK,R3
                .ENDC
                CALL    MAPPER
                .DSABL  CRF
                .IIF DF LST$$ .NLIST  ME
                .ENABL  CRF
                POP     R3
                .ENDM   MAP
```

```
                        .SBTTL  MACRO   SUPERVISOR
                ;****************** SUPERVISOR ********************
                ;
                ; THIS MACRO SWITCHES TO SUPERVISOR MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;*************************************************

                        .MACRO  SUPERVISOR
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     #BIT14,PSW              ;DO IT TO IT!
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   SUPERVISOR

                        .SBTTL  MACRO   USER
                ;********************* USER ***************************
                ;
                ; THIS MACRO SWITCHES TO USER MODE.
                ;
                ;ARGUEMENTS: NONE.
                ;
                ;*************************************************

                        .MACRO  USER
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        BIS     #BIT15!BIT14,PSW                ;DO IT TO IT!
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   USER
```

```
                        .SBTTL  MACRO   SET4 & RES4
                ;****************** SET4 & RES4 ********************
                ;
                ; THESE MACROS SET & RESTORE VECTOR 4(TIMEOUT TRAP)
                ;
                ; IN IT'S RESTORED MODE TRAPS ARE REPORTED AS SUCH.
                ;
                ;ARGUEMENTS:    LOC     ;THE LOCATION TO VECTOR TO (ONLY USED IN 'SET4' NOT 'RES4')
                ;
                ;I USE THE SET4 AND RES4 MACROS AROUND CODE THAT I EXPECT TO TRAP TO 4
                ;LIKE LOOKING FOR ALL POSSIBLE CSR'S AND ETC.  WHENEVER CODE IS NOT
                ;SURROUNDED BY SET4 AND RES4 THEN ANY TRAPS TO 4 WILL CAUSE AN ERROR
                ;PRINTOUT THAT SAYS 'UNEXPECTED TRAP TO 4' AND ALL THE ASSOCIATED REGISTER
                ;*************************************************

                        .MACRO  SET4    ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     ARG,4
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   SET4

                        .MACRO  RES4
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        MOV     #TIMEOUT,4
                        CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                ;THAT A EXPECTED TRAP COULD HAVE SET
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   RES4
```

```
                        .SBTTL  MACRO   DLEFT
                ;*************** DLEFT ************************
                ;
                ; THIS MACRO DOES A DOUBLE WORD LEFT SHIFT
                ;
                ;ARGUEMENTS:    LOC     ;THE LOCATION TO BE SHIFTED LEFT (CARRY TO LOC+2)
                ;
                ;*************************************************

                        .MACRO  DLEFT   ARG
                        .NLIST
                        .DSABL  CRF
                        .IIF DF LST$$ .LIST  ME
                        .ENABL  CRF
                        .LIST
                        ROL     ARG
                        ROL     ARG+2
                        .DSABL  CRF
                        .IIF DF LST$$ .NLIST  ME
                        .ENABL  CRF
                        .ENDM   DLEFT
                        .NLIST  MD              ;DON'T NEED TO SEE THEM ANY MORE
```

```
1063                                    .SBTTL  TRAP CATCHER
1064            000000                  .=0
1065 000000    000000  000000           .WORD   0,0
1066            000177                  .REPT   177             ;.WORD  .+2,HALT
1070
1071                                    .SBTTL  ACT11 HOOKS
1072                            ;*THE HOOKS REQUIRED BY ACT11 ARE DEFINED AND SETUP BELOW:
1073                            ;*      DEFINITIONS:
1074                            ;*                      1)LOC.46        'END-OF-PASS' HOOK
1075                            ;*                              =ADDRESS OF END OF PASS ROUTINE
1076                            ;*                               MODIFIED BY ACT11.
1077                            ;*                      2)LOC.52        PROGRAM NEEDS HOOK
1078                            ;*                              BIT 15=1 PROGRAM SHOULD BE POWER
1079                            ;*                                       FAILED WHILE RUNNING
1080                            ;*                                     =0 NO POWER FAIL
1081                            ;*                              BIT 14=1 PROGRAM MEMORY SIZE DEPENDENT
1082                            ;*                                     =0 NOT MEMORY SIZE DEPENDENT
1083                            ;*                              BIT 13=1 PROGRAM REQUIRES MANUAL INTERVENTION
1084                            ;*                                     =0  MANUAL INTERVENTION NOT REQUIRED
1085                            ;*                              BITS 12-0  MUST BE ZERO'S
1086            000046                  .=46
1087 000046    015000                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
1088            000052                  .=52
1089 000052    040000                  .WORD   BIT14           ;;2)SET LOC.52 TO INDICATE MEMORY SIZE DEPENDANT
1090                                    .SBTTL  APT11 HOOKS
1091            000024                  .-24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
1092 000024    000200                  200     ;;FOR APT START UP
1093            000042                  .=42
1094 000042    002000                  STACK                   ;SO RT11 CAN START WITH RUN COMMAND
1095            000044                  .-44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
1096 000044    075236                  $APTHDR ;;POINT TO APT HEADER BLOCK
1097            000200                  .=200
1098 000200    000437          START3: BR      START1          ;'NORMAL' START
1099 000202    000442                  BR      START2          ;RESTART (SAVE ERROR ACCOUNTING)
1100 000204    000446                  BR      START4          ;'RUN MULTIPROCESSOR TESTS WITHOUT THE IIST' START
1101            000300                  .-300
1102 000300    005037  002752  START1: CLR     RESTART
1103 000304    000137  004352          JMP     START
1104 000310                    START2: SET     RESTART                                 MOV  #-1,RESTART
     000310    012737  177777  002752
1105 000316    000137  004352          JMP     START
1106 000322                    START4: SET     NOIIST                                  MOV  #-1,NOIIST
     000322    012737  177777  002756
1107 000330    000137  000300          JMP     START1
1108            002000                  . STACK
```

```
1111                                    .SBTTL  VARIABLES       INITIALIZED TO ZERO
1112                                ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
1113                                ;*USED IN THE PROGRAM.
1114 002000                        $CMTAG:                         ;;START OF COMMON TAGS
1115 002000  000000                BADCSR: 0                       ;CSR DETERMINED TO HAVE AN ERROR BY BAD BOX ROUTINE
1116 002002  000000                SELONLY:0                       ;SELECT ONLY BANKS MARKED BY FIELD SERVICE MODE ( AC
1117 002004  000000                MULTIONLY:0                     ;RUN ONLY MULTIPORT TESTS FLAG
1118 002006  000000                DIAGFLAG:0                      ;SET FOR SHIFTING DIAGONAL TEST
1119 002010  000000                KAMIKAZE:0                      ;SET FOR KAMIKAZE MODE TESTING
1120 002012  000000                SKIPKAMI:0                      ;USED TO SKIP RESTORING KAMIKAZE MODE WHEN MODIFIED
1121                                ;NEXT TWO BYTES ARE DISPLAYED IN THE DISPLAY REGISTER
1122 002014      000                $PATMAR:.BYTE   0               ;PATTERN NUMBER & MARGIN VALUE
1123 002015      000                $BANK:  .BYTE   0               ;BANK & SIGN = MARGIN INDICATOR
1124 002016      000                $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
1125 002017      000                $ITEMB. .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
1126 002020  000000                LASTERROR:.WORD 0               ;NUMBER OF ERRORS ON LAST PASS
1127 002022  000000                SBEFLAG:.WORD   0               ;A SINGLE BIT ERROR HAS OCCURED THIS PASS
1128 002024  000000                ERRPC:  .WORD   0               ;CONTAINS PC OF ERROR FOR TYPEOUT
1129 002026  000000                BADPC:  .WORD   0               ;CONTAINS PC OF ERROR
1130 002030  000000                ERRSP:  .WORD   0               ;CONTAINS SP OF ERROR FOR TYPEOUT
1131 002032  000000                BADSP:  .WORD   0               ;CONTAINS SP OF ERROR
1132 002034  000000                ERRPSW: .WORD   0               ;CONTAINS PSW OF ERROR FOR TYPEOUT
1133 002036  000000                BADPSW: .WORD   0               ;CONTAINS PSW OF ERROR
1134 002040  000000                ADDRESS:.WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
1135 002042  000000                PADDRESS:.WORD  0               ;ADDRESS OF PARITY ERROR
1136 002044  000000  000000        PHYADD: .WORD   0,0             ;22 BIT PHYSICAL ADDRESS
1137 002050  000000                GOOD:   .WORD   0               ;;CONTAINS 'GOOD' DATA
1138 002052  000000                GOOD2:  .WORD   0               ;;CONTAINS 'GOOD2' DATA
1139 002054  000000                GOOD3:  .WORD   0               ;;CONTAINS 'GOOD3' DATA
1140 002056  000000                BAD:    .WORD   0               ;;CONTAINS 'BAD' DATA
1141 002060  000000                BAD2:   .WORD   0               ;;CONTAINS 'BAD2' DATA
1142 002062  000000                BAD3:   .WORD   0               ;;CONTAINS 'BAD3' DATA
1143 002064  000000                BADXOR: .WORD   0               ;XOR OF GOOD & BAD = BAD BITS.
1144 002066  000000                $AUTO:  .WORD   0               ;;AUTOMATIC MODE INDICATOR FOR APT,ACT, & XXDP
1145 002070  000000                FATAL$: .WORD   0               ;FATAL ERROR INDICATOR
1146 002072  000000                NEMCNT: 0                       ;NON-EXISTANT MEMORY COUNTER (HOLES)
1147 002074  000000                PARCNT: 0                       ;PARITY ERROR COUNTER
1148 002076  000000                PATERR: 0                       ;PATTERN ERROR COUNTER
1149 002100  000000                NOPAR:  0                       ;NO PARITY ERROR MODE INDICATOR
1150 002102  000000                NONEM:  0                       ;NO NON-EXISTANT MEMORY (HOLES) MODE INDICATOR
1151 002104  000000                NOCLOCK:0                       ;NO LINE CLOCK IS ON THIS SYSTEM
1152 002106  000000                BANK:   0                       ;MEMORY BANK UNDER TEST
1153 002110  000000                BANKINDEX:0                     ;USED TO INDEX INTO CONFIG TABLE
1154 002112  000000                MARGIN: 0                       ;INDICATES WHICH MARGIN IS IN PROGRESS
1155 002114  000000                CPUBIT: 0                       ;CONTAINS 1 BIT TO IDENTIFY CPU TO CONFIGURATION TABLE
1156 002116  000000                MUT:    0                       ;MEMORY UNDER TEST FLAG
1157 002120  000000                PATTERN:0                       ;PATTERN NUMBER UNDER TEST
1158 002122  000000                KPFLAG: 0                       ;BANK IS PROTECTED REGION OF MK11
1159 002124  000000                ACFLAG: 0                       ;BANK CAN BE ACCESSED BY THIS CPU
1160 002126  000000                MKFLAG:0                        ;IF SET INDICATES MK11 UNDER TEST
1161 002130  000000                PFLAG:  0                       ;BANK IS IN PROGRAM SPACE
1162 002132  000000                RRFLAG: 0                       ;BANK IS WHERE PROGRAM RELOCATION IS REQUIRED TO TEST
1163 002134  000000                RLFLAG: 0                       ;PROGRAM IS RELOCATED FLAG
1164 002136  000000                BMFLAG: 0                       ;"BANK IS IDENTIFIED AS BAD MEMORY" FLAG
1165 002140  000000                TMFLAG: 0                       ;"TYPE OF MEMORY TO TEST" FLAG; 0 = MK11
1166 002142  000000                ABORTFLAG:0                     ;"ABORT OCCURED" FLAG
1167 002144  000000  000000        CSR:    .WORD   0,0             ;DATA TO OR FROM CSR
```

```
1168 002150  000000 ABOOOOOCATED TO SBADSR:MEMORD FLAGO          ;CSR STORED HERE ON MK11 DETECTED SB3   002254  000000
1174 002256  000000                 CSRNO:  0                    ;CSR ADDRESS NUMBER (3 LSB'S)
1175 002260  000000                 FIRSTB: 0                    ;FIRST BANK CONTROLLED BY THIS CSR
1176 002262  000000                 LASTB:  0                    ;LAST BANK CONTROLLED BY THIS CSR
1177 002264  000000                 INTERL: 0                    ;INTERLEAVE FACTOR (0,1,2,3)
1178                                         ;THESE LOCATIONS STORE GPR'S DURING SUPERVISOR TESTS
1179 002266  000000                 SUPDR0: 0
1180 002270  000000                 SUPDR1: 0
1181 002272  000000                 SUPDR2: 0
1182 002274  000000                 SUPDR3: 0
1183 002276  000000                 SUPDR4: 0
1184 002300  000000                 SUPDR5: 0
1185 002302  000000                 SUPDR6: 0
1186 002304  000000                 DUMMY:  0                    ;DUMMY LOCATION FOR ADDRESS PASSING
1187                                 ;THESE LOCATIONS STORE GPR'S & PSW DURING DETAILED ERROR PRINTOUTS
1188 002306  000000                 DETR0:  0
1189 002310  000000                 DETR1:  0
1190 002312  000000                 DETR2:  0
1191 002314  000000                 DETR3:  0
1192 002316  000000                 DETR4:  0
1193 002320  000000                 DETR5:  0
1194 002322  000000                 DETSP:  0
1195 002324  000000                 DETPSW: 0
1196 002326  000000                 DETFLAG:0                    ;DETAILED REPORT FLAG
1197 002330  000000                 PENDBOX:0                    ;1 BIT PER EXISTING CSR THAT STARTS AT A BANK ABOVE 166
1198                                                             ;CSR'S 0,1,2,3,4,5,6,7 REPRESENTED BY BITS
1199                                                             ;7,6,5,4,3,2,1,0 RESPECTIVELY
1200 002332  000000                 CONTFLAG:0                   ;MK11 CONTROL'S HAVE BEEN TESTED FLAG
1201 002334  000000                 MKCSRS: .WORD   0       ;LO BYTE;1 BIT PER EXISTING CSR
1202                                                             ;CSR'S 0,1,2,3,4,5,6,7 REPRESENTED BY BITS
1203                                                             ;7,6,5,4,3,2,1,0 RESPECTIVELY
1204                                                        ;HI BYTE;1 BIT PER EXISTING CSR WITH INTERNAL INTERLEAVE
1205                                                             ;INTERNAL INTERLEAVE REPRESENTED BY BITS
1206                                                             ;15,14,13,12,11,10,9,8 RESPECTIVELY
1207 002336  000000                 CSRFIRST:0                   ;FIRST ADDRESS UNDER CONTROL OF THIS CSR
1208 002340  000000  000000         DATBUF: .WORD   0,0          ;TWO WORD DATA BUFFER
1209 002344  000000  000000         TSTDAT: .WORD   0,0          ;TWO WORD TEST DATA
1210 002350  000000  000000         SBEMSK: .WORD   0,0          ;TWO WORD SINGLE BIT ERROR MASK
1211 002354  000000  000000         DBEMSK: .WORD   0,0          ;TWO WORD DOUBLE BIT ERROR MASK
1212 002360  000000                 SUPDOADD:0                   ;ADDRESS OF SUBROUTINE TO EXECUTE IN SUPERVISOR MODE
1213 002362     000                 PASFLG: .BYTE   0            ;LOCAL LOOP PASS CONTROL
1214 002363     000                 UPPFLG: .BYTE   0            ;LOCAL LOOP PASS CONTROL
1215 002364  000000                 STRTDI: 0                    ;LOAD STRTDI WITH THE STARTING ADDRESS OF THE DIAGONAL
1216 002366  000000                 REALPAT.0                    ;REAL PATTERN UNDER TEST
```

```
1217 002370  000000                OLDCACHE:0                      ;BACKED UP VALUE OF CACHE CONTROL REGISTER
1218 002372  000000                PARTHERE:0                      ;PARITY TRAPS SOMETIMES GO TO ADDRESS STORED HERE
1219 002374  000000                FSSTACK.0                       ;STACK SAVED HERE IF IN FIELD SERVICE MODE
1220 002376  000000                OLDMARGIN:0                     ;BACKED UP VALUE OF LAST MARGIN SETTING
1221 002400  000000                NEWBANK:0                       ;USED FOR RELOCATION TO A NEW BANK
1222 002402  000000                SOURCE: .WORD 0                 ;SOURCE OF DATA WORDS FOR CHECKBIT GENERATION SUBROUTINE
1223 002404  000000                CHECK:  .WORD 0                 ;CHECKBITS TO BE LOADED INTO CSR
1224 002406  000000                PCBUMP: .WORD 0                 ;VALUE TO BUMP THE PC BY TO RECOVER AFTER A PARITY TRAP
1225 002410  000000                CSRFBANK:0                      ;FIRST BANK OWNED (AT LEAST IN PART) BY THIS CSR
1226 002412  000000                CSRLBANK:0                      ;LAST BANK OWNED (AT LEAST IN PART) BY THIS CSR
1227 002414  000000                CSRINC: 0                       ;VALUE TO INCREMENT ADDRESS BY TO REMAIN IN THE SAME CSR
1228 002416     000                CSRINDEX:.BYTE  0               ;AN INDEX VARIABLE FOR A CSR LOOP
1229 002417     000                CSROUDEX:.BYTE  0               ;AN INDEX VARIABLE FOR A CSR LOOP
1230 002420  000000                CSRLOOP:0                       ;LOOP CONTROL FOR CSR TESTING
1231 002422  000000                SIDE:   0                       ;INDEX VARIABLE FOR EACH SIDE (CONTROLLER) OF A CSR
1232 002424  000000                SUCCESS:0                       ;FLAG SET BY SUCCESSFULL TASK OR SUBROUTINE
1233 002426  000000                ZERO:   0                       ;FOR AID IN "MOV" INSTRUCTIONS
1234 002430  000000                ZEROS:  0                       ;FOR AID IN "MOV" INSTRUCTIONS
1235 002432  000000                SPECIAL:0                       ;FLAG FOR SPECIAL CASE OF NO INTERNAL INTERLEAVE
1236 002434  000000                TIME:   0                       ;SECONDS THAT BATTERIES SHOULD LAST
1237 002436  000000                NULLFLAG:0                      ;SET WHEN RUNNING NULL PATTERNS
1238 002440  000000                QVFLAG: 0                       ;FLAGS QUICK VERIFY PASS UNDER APT, ACT, OR XXDP CHAIN MODE
1239 002442  000000                ACTFLAG:0                       ;FLAGS ACT AUTOMATIC MODE PROGRAMMING RULES
1240 002444  000000                APTFLAG:0                       ;FLAGS APT AUTOMATIC MODE PROGRAMMING RULES
1241 002446  000000                XXDPCHAIN:0                     ;FLAGS XXDP CHAIN MODE PROGRAMMING RULES
1242                               ;NOTE: THESE TWO BYTES MUST STAY TOGETHER
1243 002450     000                $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
1244 002451     000                $FILLS: .BYTE   0               ;CONTAINS # OF FILL CHARACTERS
1245 002452     000                $TPFLG: .BYTE   0               ;;"TERMINAL NOT AVAILABLE" FLAG
1246                                       .EVEN
1247 002454  000000                $ESCAPE:0                       ;;ESCAPE ON ERROR ADDRESS
1248 002456  000000                EVEN:   0                       ;USED FOR ALTERNATE DATA PATTERNS
1249 002460  000000                STRIPES:0                       ;COUNTS DIAGONAL STRIPES
1250 002462  000000                COUNT:  0                       ;BACKED UP COPY OF STRIPES
1251 002464  000000                NOTAB:  0                       ;NO TABLE BEING PRINTED - NOW
1252 002466  000000                MJSIZE: 0                       ;SIZE OF MJ11 MEMORY IN K WORDS
1253 002470  000000                MKSIZE: 0                       ;SIZE OF MK11 MEMORY IN K WORDS
1254 002472  000000                TOOMANY:0                       ;FLAGS WHEN TOO MANY ERRORS HAVE BEEN PRINTED FOR A BANK
1255 002474  000000                NOECCFLAG:0                     ;ECC CAPABILITY DISABLED ON THE CONTROL PANEL
1256 002476  000000                GDSWITCH:0                      ;GOOD VALUE FOR SOME SWITCHES
1257 002500  000000                BDSWITCH:0                      ;BAD VALUE FOR SOME SWITCHES
1258 002502  000000                WRITEONLY:0                     ;FLAG TO PATTERNS TO WRITE ONLY
1259 002504  000000                READONLY:0                      ;FLAG TO PATTERNS TO READ ONLY
1260 002506  000000                TESTADD:0                       ;THE ADDRESS TO RUN CSR TESTS ON
1261 002510  000000                ALLCPUS:0                       ;CPUBIT'S FOR ALL CPU'S PRESENT
1262 002512  000000                HIBANK: 0                       ;HIGHEST BANK OF MEMORY
1263 002514  000000                HIACBANK:       0                       ;1ST INACCESSABLE BANK OF MEMORY
1264 002516  000000                UNITOP: 0                       ;HIGHEST ACCESSABLE BANK OF MEMORY THRU UNIBUS MAP
1265 002520  000000                STOPOK: 0                       ;FLAG TO ALLOW STOPPING WITH SWITCH REGISTER
1266 002522  000000                APTCORE:0                       ;AMOUNT OF CORE MEMORY ACCORDING TO APT
1267 002524  000000                APTMOS: 0                       ;AMOUNT OF MOS MEMORY ACCORDING TO APT
1268 002526  000000                NOFSMODE:0                      ;FLAG TO DISABLE FIELD SERVICE MODE
1269 002530  000000                NOERROR:0                       ;"THIS IS NOT AN ERROR" FLAG
1270 002532  000000                LOADBANK:0                      ;BANK LOADERS ARE RELOCATED TO
1271 002534  000000                TEMP:   0                       ;USED FOR JUNK
1272 002536  000000                QUICK:  0                       ;QUICK STOP FLAG FOR APT POWER FAIL
1273 002540  000000                NOSCOPE:0                       ;"NO SCOPE LOOP ALLOWED" FLAG
```

```
1274 002542 000000                  FSINFLAG:0                  ;'FIELD SERVICE - NO INTERNAL INTERLEAVE'' FLAG
1275 002544 000000                  APTSIZE:0                   ;APT SIZING INFO FLAG
1276 002546 000000                  FS7FLAG:0                   ;TRUE WHEN IN FIELD SERVICE COMMAND 7
1277 002550 000000                  KI0:    0                   ;SAVED KIPAR0 TO PASS CORRECT VALUE TO SLAVE
1278 002552 000000                  KI1:    0                   ;SAVED KIPAR1 TO PASS CORRECT VALUE TO SLAVE
1279 002554 000000                  KI2:    0                   ;SAVED KIPAR2 TO PASS CORRECT VALUE TO SLAVE
 280 002556 000000                  KI3:    0                   ;SAVED KIPAR3 TO PASS CORRECT VALUE TO SLAVE
1281 002560 000000                  KI4:    0                   ;SAVED KIPAR4 TO PASS CORRECT VALUE TO SLAVE
1282 002562 000000                  KI5:    0                   ;SAVED KIPAR5 TO PASS CORRECT VALUE TO SLAVE
1283 002564 000000                  KI6:    0                   ;SAVED KIPAR6 TO PASS CORRECT VALUE TO SLAVE
1284 002566 000000                  KI7:    0                   ;SAVED KIPAR7 TO PASS CORRECT VALUE TO SLAVE
1285 002570 000000                  SLAVERROR:0                 ;SLAVE HAD AN ERROR FLAG
1286 002572 000000                  HUNGMSB:0                   ;USED FOR TIMES OVER 13 SECONDS
1287 002574 000000                  HUNGTIME:0                  ;TIME TO ALLOW THE SYSTEM TO BE HUNG (MAX   13. SEC)
1288 002576 000000                  CONFGERROR:0                ;CONFIGURATION ERROR FLAG
1289 002600 000000                  TWOCSRS:0                   ;TO FLAG LOADCSR TRAP TO LOAD TWO CSR'S
1290 002602 000000                  I:      0                   ;USED FOR GENERAL PURPOSE INDEXING
1291 002604 000000                  J:      0                   ;USED FOR GENERAL PURPOSE INDEXING
```

```
1294                                            .SBTTL  MULTIPORT VARIABLES
1295                                    ;MULTIPORT DIRECTORY
1296                                    ;PORTDIR:MASTER IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
1297                                    ;       SLAVE IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
1298                                    ;       SLAVE IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
1299                                    ;       SLAVE IIST ID NUMBER OR SYSTEM ID NUMBER IF IIST DISABLED BY OPERATOR
1300 002606  000000  000000  000000  PORTDIR:.WORD   0,0,0,0
     002614  000000
1301 002616  000000  000000  000000  TASK:   .WORD   0,0,0,0
     002624  000000
1302 002626  000000  000000  000000  PTYFLAG:.WORD   0,0,0,0
     002634  000000
1303 002636  000000  000000  000000  PTYBUF: .WORD   0,0,0,0
     002644  000000
1304 002646  000000  000000  000000  PORTCOUNT:.WORD 0,0,0,0
     002654  000000
1305 002656  000000  000000  000000  SLFLAG: .WORD   0,0,0,0
     002664  000000
1306 002666  000000                  MINDEX: 0                       ;MASTER CPU'S INDEX # TO TABLES ABOVE
1307 002670  000000                  LOCK:   0                       ;MULTIPROCESSOR LOCK
1308 002672  000000                  ACK:    0                       ;ACKNOWLEDGE FLAG (USED FOR STARTING SLAVES)
1309 002674  000000                  MASWR:  0                       ;MASTER'S SWR
1310 002676  000000                  MDISPLAY:0                      ;MASTER CPU DISPLAY WHEN RUNNING MULTIPROCESSOR TESTS
1311 002700                          $CMTGE: ;*END OF COMMON TAGS
```

```
                                        .SBTTL  VARIABLES       INITIALIZED TO NON ZERO
002700  000001                  CACHK:  1                       ;CACHE CONSTANT (MOVED TO CONTRL TO TURN ON CACHE)
002702  000012                  ERRMAX: 10.                     ;MAX # OF ERRORS PER BANK WITH SW11
002704  000031                  SOBK:   25.                     ;SOB CONSTANT
002706  002000                  KSTACK: STACK                   ;STACK BEGINNING (USED TO KEEP SLAVES STACKS SEGREGATED)
002710  000001                  LOADHOME:1                      ;HOME BANK OF LOADERS
002712  177777                  WORST:  177777                  ;SET IF TESTING BANKS IN WORST FIRST MODE(1ST PASS)
002714  176543                  SEEDHI: 176543                  ;WORKING SEED HI (USED FOR RANDOM NUMBER GENERATOR)
002716  123456                  SEEDLO: 123456                  ;WORKING SEED LO (USED FOR RANDOM NUMBER GENERATOR)
002720  176543                  MSEEDH: 176543                  ;MASTER SEED HI (USED FOR RANDOM NUMBER GENERATOR)
002722  123456                  MSEEDL: 123456                  ;MASTER SEED LO (USED FOR RANDOM NUMBER GENERATOR)
002724  177777                  HEADER: 177777                  ;USED TO PRINT HEADINGS ONLY ONCE
002726  177777                  ONES:   177777                  ;FOR AID IN 'MOV'' INSTRUCTIONS
002730  000000                  SLAVES: 0                       ;# OF SLAVE CPU'S
002732  000000                  ONCE:   0                       ;FLAG FOR TYPING TITLE ONLY ONCE
002734  000003                  FLIPLOC:3                       ;COUNTER FOR FLIPING DATA ON WORST CASE NOISE TEST
002736  177500                  IISTACR:177500                  ;ADDRESS OF THE IIST ACR (WAS 166000)
002740  177502                  IISTADR:177502                  ;ADDRESS OF THE IIST ADR (WAS 166002)
002742  000260                  IISTVEC:260                     ;ADDRESS OF THE IIST VECTOR (WAS 170)
002744  052525                  SOFTPAT:52525                   ;PATTERN FOR SOFT ERROR BACKGROUND TESTS
002746  000000                  $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
002750  000000                  $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
002752  000000                  RESTART:0                       ;RESTART (START ADD 202) FLAG
002754  000000                  $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS
002756  000000                  NOIIST: 0                       ;NO IIST IS TO BE USED DURING MULTIPORT TESTS
002760  000000                  PWLOCK: 0                       ;MULTIPROCESSOR LOCK FOR POWER FAILURE

                                ;********************** NOTE THESE TWO LOCATIONS MUST STAY TOGETHER ************
002762  000377                  BAKPAT: .WORD   377             ;BACKGROUND PATTERN                              *
002764  177400                  SWAPAT: .WORD   177400          ;SWAPPED BAKPAT                                  *
                                ;*****************************************************************************

002766  177570                  SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
002770  177570                  DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
002772  177560                  $TKS:   177560                  ;;TTY KBD STATUS
002774  177562                  $TKB:   177562                  ;;TTY KBD BUFFER
002776  177564                  $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
003000  177566                  $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
003002     012                  $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A 'LINE FEED''
003003     207  377     377     $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
003006     000
003007     077                  $QUES:  .ASCII  /?/             ;;QUESTION MARK
003010     015                  $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
003011     012  000             $LF:    .ASCIZ  <12>            ;;LINE FEED
                                        .EVEN
003014  000000                  MULTIPORT:0                     ;MULTIPROCESSING FLAG
```

```
                                .SBTTL  CONFIGURATION TABLE
                        ;CONFIG:FIRST 16K CONFIGURATION WORDS (3 EACH)
                        ;       2ND     16K CONFIGURATION WORDS (3 EACH)
                        ;       .......................
                        ;       167TH    16K CONFIGURATION WORDS (3 EACH)
                        ;
                        ;CONFIGURATION WORDS:
                        ;                       LOW:    BIT 0-2   INTERLEAVE FACTOR
                        ;                               BIT 3     EXTERNAL INTERLEAVE
                        ;                               BIT 4     MASTER CAN ACCESS (MEMORY EXISTS)
                        ;                               BIT 5     SLAVE #1 CAN ACCESS (SHARED)
                        ;                               BIT 6     SLAVE #2 CAN ACCESS (SHARED)
                        ;                               BIT 7     SLAVE #3 CAN ACCESS (SHARED)
                        ;                               BIT 8-10  BOX NUMBER (0-7)
                        ;                               BIT 11    ERRORS PRESENT
                        ;                               BIT 12    PROTECTED REGION OF A MK11 BOX
                        ;                               BIT 13-14 MEMORY TYPE;0=MJ11;1=MK11
                        ;                               BIT 15    PROTECTED (PROGRAM SPACE)
                        ;                       MED:    BIT 0-5   NOT USED
                        ;                               BIT 6-8   MK11 CSR ADDRESS
                        ;                               BIT 9-11  NOT USED
                        ;                               BIT 12    INTERNAL INTERLEAVE
                        ;                               BIT 13    'BACKGROUND PATTERN VALID'' FLAG
                        ;                               BIT 14    BANK SELECTED FOR TEST BY FIELD SERVICE MODE
                        ;                               BIT 15    LOADERS HOME BANK
                        ;                       HIGH:   BIT 0     INDICATES BANK IS ADDRESSED BY CSR 172100
                        ;                               BIT 1     INDICATES BANK IS ADDRESSED BY CSR 172104
                        ;                               BIT 2     INDICATES BANK IS ADDRESSED BY CSR 172110
                        ;                               BIT 3     INDICATES BANK IS ADDRESSED BY CSR 172114
                        ;                               BIT 4     INDICATES BANK IS ADDRESSED BY CSR 172120
                        ;                               BIT 5     INDICATES BANK IS ADDRESSED BY CSR 172124
                        ;                               BIT 6     INDICATES BANK IS ADDRESSED BY CSR 172130
                        ;                               BIT 7     INDICATES BANK IS ADDRESSED BY CSR 172134
                        ;                               BIT 8-15  NUMBER OF ERRORS
003016  000170          CONFIG: .REPT   170
004336  000000  000000  000000 CONFIEND:.WORD  0,0,0,0,0,0      ;THESE WORDS SHOULD NEVER GET WRITTEN INTO
004344  000000  000000  000000
                                                               ;IF THEY DO THE PROGRAM IS OVERFLOWING IT'S
                                                               ;CONFIGURATION TABLE (SOFTWARE BUG)!
```

```
1402                                            .SBTTL  ********** MAIN **********
1403 004352                             START:  SUBTST  <<INITIALIZE VARIABLES TO ZERO>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       INITIALIZE VARIABLES TO ZERO
                                        ;*****************************************************************************
1404 004352                                     SET     ACK             ;ACKNOWLEDGE THAT I HAVE STARTED (IN CASE I'M A SLAVE)
     004352  012737  177777  002672                                                        MOV  #-1,ACK
1405 004360  000005                             RESET
1406 004362  013706  002706                     MOV     KSTACK,SP       ;;SETUP THE STACK POINTER
1407 004366                                     IF MULTIPORT EQ ONES AND CPUBIT NE #MASTER
     004366  023737  003014  002726                                                        CMP MULTIPORT,ONES
     004374  001014                                                                      BNE L0
     004376  023727  002114  000020                                                      CMP CPUBIT,#MASTER
     004404  001410                                                                      BEQ L0
1408                                              ;WAIT FOR ACK TO CLEAR OR TIMEOUT & HALT
1409 004406  005004                               CLR R4
1410 004410                             1$:       IF ACK IS TRUE
     004410  005737  002672                                                            TST ACK
     004414  001402                                                                    BEQ L1
1411 004416  077404                                SOB R4,1$
1412 004420  000000                     SHALT:     HALT                ;THE MASTER WOULD NOT ALLOW THIS SLAVE TO PROCEED
1413 004422                                       END ;OF IF ACK IS TRUE
     004422                                                                         L1:::::::
1414 004422  000137  005752                       JMP BEGIN
1415 004426                                     END ;OF IF MULTIPORT
     004426                                                                         L0:::::::
1416 004426  012700  002000                     MOV     #$CMTAG,R0      ;;FIRST LOCATION TO BE CLEARED
1417 004432  005020                     1$:     CLR     (R0)+           ;;CLEAR MEMORY LOCATION
1418 004434  022700  002700                     CMP     #$CMTGE,R0      ;;DONE?
1419 004440  001374                             BNE     1$              ;LOOP BACK IF NO
1420 004442                                     SUBTST  <<CLEAR NON-PROGRAM SPACE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       CLEAR NON-PROGRAM SPACE
                                        ;*****************************************************************************
1421                                            ;THIS ATTEMPS TO GET RID OF ANY PARITY ERRORS BY WRITING INTO
1422                                            ;EVERY LOCATION THAT IS NOT LOADED INTO BY THE PROGRAM OR ALLOCATED
1423                                            ;TO THE XXDP LOADERS
1424 004442  012737  000004  002100             MOV     #4,NOPAR                ;PARITY ACTION - COUNT & IGNORE
1425 004450  012700  001000                     MOV     #1000,R0
1426 004454  012737  000015  177746             MOV     #15,CNTRL               ;DISABLE CACHE & ABORTS
1427 004462  012720  000000             9$:     MOV     #0,(R0)+                ;CLEAR THE STACK AREA
1428 004466  020027  002000                     CMP     R0,#STACK
1429 004472  103773                             BLO     9$
1430 004474  012700  117146                     MOV     #END+2,R0
1431 004500  012720  000000             8$:     MOV     #0,(R0)+                ;CLEAR FROM THE END OF THE PROGRAM TO THE xxDP LOADE
1432 004504  020027  137776                     CMP     R0,#157776-8192.
1433 004510  103773                             BLO     8$
1434 004512  005037  002100                     CLR     NOPAR                   ;RESTORE DEFAULT PARITY ACTION
1435
1436 004516  005237  002670                     INC     LOCK            ;ONLY ALLOW ONE CPU AT A TIME TO GO THRU HERE
1437 004522                                     IF  LOCK NE #1
     004522  023727  002670  000001                                                        CMP LOCK,#1
     004530  001402                                                                      BEQ L2
1438 004532  000000                     MHALT1:    HALT                    ;MULTIPLE MASTER CPU'S ARE RUNNING
1439 004534  000776                             BR     MHALT1
1440 004536                                     END ;OF IF LOCK
     004536                                                                         L2:::::::
```

```
1443 004536                            SUBTST  <<INITIALIZE VARIABLES TO NON ZERO>>
                                ;*****************************************************************************
                                ;*SUBTEST        INITIALIZE VARIABLES TO NON ZERO
                                ;*****************************************************************************
1444 004536                             SET     WORST
     004536  012737  177777  002712                                                  MOV  #-1,WORST
1445 004544  012737  000003  002734     MOV     #3,FLIPLOC
1446 004552                             SET     HEADER
     004552  012737  177777  002724                                                  MOV  #-1,HEADER
1447 004560  012737  176543  002720     MOV     #176543,MSEEDH
1448 004566  012737  123456  002722     MOV     #123456,MSEEDL
1449 004574  013737  002720  002714     MOV     MSEEDH,SEEDHI   ;PRIME THE RANDOM NUMBER GENERATOR
1450 004602  013737  002722  002716     MOV     MSEEDL,SEEDLO   ;BOTH HIGH AND LOW WORDS
1451 004610  012737  000377  002762     MOV     #377,BAKPAT
1452 004616  012737  177400  002764     MOV     #177400,SWAPAT
1453 004624  012737  052525  002744     MOV     #52525,SOFTPAT
1454 004632  012737  005752  002746     MOV     #BEGIN,$LPADR   ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
1455 004640  012737  005752  002750     MOV     #BEGIN,$LPERR   ;;SETUP THE ERROR LOOP ADDRESS
1456 004646                             SUBTST  <<INITIALIZE VECTORS>>
                                ;*****************************************************************************
                                ;*SUBTEST        INITIALIZE VECTORS
                                ;*****************************************************************************
1457 004646  012737  066232  000020     MOV     #$SCOPE,IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
1458 004654  012737  000340  000022     MOV     #340,IOTVEC+2   ;;LEVEL 7
1459 004662  012737  066662  000030     MOV     #$ERROR,EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
1460 004670  012737  000340  000032     MOV     #340,EMTVEC+2   ;;LEVEL 7
1461 004676  012737  075252  000034     MOV     #$TRAP,TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
1462 004704  012737  000340  000036     MOV     #340,TRAPVEC+2;LEVEL 7
1463 004712  012737  055160  000024     MOV     #$PWRDN,PWRVEC ;;POWER FAILURE VECTOR
1464 004720  012737  000340  000026     MOV     #340,PWRVEC+2   ;;LEVEL 7
1465 004726  012737  036454  000114     MOV     #PARITY,PARVEC;GET READY FOR PARITY ERRORS
1466 004734  012737  000340  000116     MOV     #340,PARVEC+2
1467 004742  012737  036752  000010     MOV     #PDP1105,RESVEC;RESERVED INSTRUCTION TRAP
1468 004750  012737  000340  000012     MOV     #340,RESVEC+2
1469 004756  012737  036726  000004     MOV     #TIMEOUT,ERRVEC;SETUP TIMEOUT ERRORS
1470 004764  012737  000340  000006     MOV     #340,ERRVEC+2   ;SET PRIORITY OF ERROR TRAPS
1471 004772  012737  036740  000250     MOV     #MMTRAP,MMVEC   ;VECTOR FOR MEMORY MANAGEMENT
1472 005000  012737  000340  000252     MOV     #340,MMVEC+2
1473 005006  012737  036764  000170     MOV     #IITRAP,170     ;SET UP FOR UNEXPECTED IIST TRAPS
1474 005014  012737  000340  000172     MOV     #340,172
1475 005022  104423                     CACHON                  ;TURN CACHE ON
```

```
1479 005024                             SUBTST  <<CLEAR THE CONFIGURATION TABLE>>
                                ;*****************************************************************************
                                ;*SUBTEST       CLEAR THE CONFIGURATION TABLE
                                ;*****************************************************************************
1480                            ;THIS ZEROS (UNLESS WE STARTED AT ADDRESS 202) THE CONFIG TABLE
1481                            ;WHICH IS FULLY DISCRIBED AT LOCATION "CONFIG".
1482                            .ENABLE LSB
1483 005024                     IF RESTART IS FALSE
     005024  005737  002752                                                 TST RESTART
     005030  001006                                                         BNE L3
1484 005032  012700  003016       MOV   #CONFIG,R0
1485 005036  005020         1$:  CLR   (R0)+
1486 005040  022700  004536       CMP   #CONFIEND,R0
1487 005044  001374               BNE   1$
1488 005046                     END ;OF IF RESTART
     005046                                                         L3:::::::
1489                            .DSABL  LSB
1490 005046  012737  000020  002114 MOV     #MASTER,CPUBIT          ;SET ID BIT
1491 005054                     SUBTST  <<SIZE FOR A HARDWARE SWITCH REGISTER>>
                                ;*****************************************************************************
                                ;*SUBTEST       SIZE FOR A HARDWARE SWITCH REGISTER
                                ;*****************************************************************************
1492                            ;;IF NOT FOUND OR IT IS
1493                            ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
1494                            .ENABL  LSB
1495 005054                     SET4    #3$             ;TRAPS TO 4 GOTO 3$
     005054  012737  005110  000004 MOV     #3$,4
                                .DSABL  CRF
1496 005062  012737  177570  002766 MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWITCH REGISTER
1497 005070  012737  177570  002770 MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
1498 005076                     IF #-1 EQ @SWR          ;IF NO TRAP FROM REFERENCE TO @SWR AND @SWR   #-1
     005076  022777  177777  175662                                            CMP #-1,@SWR
     005104  001017                                                            BNE L4
1499 005106  000403               BR    2$              ;;BRANCH IF NO TIMEOUT
1500 005110  012716  005116   3$:  MOV   #2$,(SP)        ;;SET UP FOR TRAP RETURN
1501 005114  000002               RTI
1502 005116                   2$: RES4                  ;RESET TRAPS TO 4 TO DEFAULT
     005116  012737  036726  000004 MOV     #TIMEOUT,4
     005124  005037  177766       CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                         ;THAT A EXPECTED TRAP COULD HAVE SET
                                .DSABL  CRF
1503 005130  012737  000176  002766   MOV   #SWREG,SWR     ;;POINT TO SOFTWARE SWR
1504 005136  012737  000174  002770   MOV   #DISPREG,DISPLAY
1505 005144                     END ;OF IF #-1
     005144                                                         L4:::::::
1506                            .DSABL  LSB
1507
1508 005144                     SUBTST  <<FIND OUT IF ANY LINE CLOCK IS PRESENT>>
                                ;*****************************************************************************
                                ;*SUBTEST       FIND OUT IF ANY LINE CLOCK IS PRESENT
                                ;*****************************************************************************
1509 005144                     SET4    #4$
     005144  012737  005160  000004 MOV     #4$,4
                                .DSABL  CRF
1510 005152  005737  177546       TST     LKS
1511 005156  000403               BR      5$              ;IF NO TRAP SKIP
1512 005160                   4$: SET     NOCLOCK         ;SET NO LINE CLOCK FLAG
```

```
      005160  012737  177777  002104
 1513 005166                          S$:     RES4                    ;RESTORE TRAPS TO 4 TO DEFAULT
      005166  012737  036726  000004          MOV     #TIMEOUT,4
      005174  005037  177766                  CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                      ;THAT A EXPECTED TRAP COULD HAVE SET
                                               .DSABL  CRF
```

```
1516 005200                            SUBAAB: SUBTST  <<SETUP ACT, APT, & XXDP>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SETUP ACT, APT, & XXDP
                                       ;*****************************************************************************
1517                                           ;THIS SETS UP A BUNCH OF FLAGS TO TELL THE PROGRAM EVERYTHING
1518                                           ;IT CARES TO KNOW ABOUT APT, ACT, & XXDP.
1519 005200  005037  075142                    CLR     $PASS           ;CLEAR PASS COUNT
1520 005204                                    IFB #BIT5 SET.IN $ENVM
     005204  132737  000040  075155                                                  BITB #BIT5,$ENVM
     005212  001403                                                                 BEQ L5
1521 005214                                      SET   $TPFLG          ;INDICATE NO TERMINAL
     005214  012737  177777  002452                                                 MOV  #-1,$TPFLG
1522 005222                                    END ;OF IFB #BIT5
     005222                                                                 L5:::::::
1523 005222                                    IFB #BIT7 SET.IN $ENVM
     005222  132737  000200  075155                                                  BITB #BIT7,$ENVM
     005230  001406                                                                 BEQ L6
1524 005232                                      SET   APTSIZE
     005232  012737  177777  002544                                                 MOV  #-1,APTSIZE
1525 005240  012737  075156  002766              MOV   #$SWREG,SWR     ;USE APT SWR
1526 005246                                    END ;OF IFB #BIT7
     005246                                                                 L6:::::::
1527 005246                                    IFB $ENV EQ #1
     005246  123727  075154  000001                                                  CMPB $ENV,#1
     005254  001020                                                                 BNE L7
1528 005256                                      SET   APTFLAG,QVFLAG,$AUTO,QUICK
     005256  012737  177777  002444                                                 MOV  #-1,APTFLAG
     005264  012737  177777  002440                                                 MOV  #-1,QVFLAG
     005272  012737  177777  002066                                                 MOV  #-1,$AUTO
     005300  012737  177777  002536                                                 MOV  #-1,QUICK
1529 005306  012737  043640  000024              MOV   #APTDOWN,PWRVEC
1530 005314                                    ELSE
     005314  000430                                                                 BR L10
     005316                                                                 L7:::::::
1531 005316                                      IF 42 NE #STACK AND 42 NE #0
     005316  023727  000042  002000                                                 CMP 42,#STACK
     005324  001424                                                                 BEQ L11
     005326  005737  000042                                                        TST 42
     005332  001421                                                                 BEQ L11
1532 005334                                        SET QVFLAG,$AUTO
     005334  012737  177777  002440                                                 MOV  #-1,QVFLAG
     005342  012737  177777  002066                                                 MOV  #-1,$AUTO
1533 005350                                        IF 42 EQ #$ENDAD
     005350  023727  000042  015000                                                 CMP 42,#$ENDAD
     005356  001004                                                                 BNE L12
1534 005360                                          SET       ACTFLAG
     005360  012737  177777  002442                                                 MOV  #-1,ACTFLAG
1535 005366                                        ELSE
     005366  000403                                                                 BR L13
     005370                                                                 L12:::::::
1536 005370                                          SET       XXDPCHAIN
     005370  012737  177777  002446                                                 MOV  #-1,XXDPCHAIN
1537 005376                                        END ;OF IF 42
     005376                                                                 L13:::::::
1538 005376                                      END ;OF IF 42
     005376                                                                 L11:::::::
1539 005376                                    END ;OF IFB $ENV
```

SEQ 0640

005376

L10:::::::

```
1542 005376                                     SUBTST  <<INITIALIZE PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       INITIALIZE PATTERNS
                                        ;*****************************************************************************
1543                                    ;THE APT E-TABLE DETERMINES WHICH PATTERNS ARE GOING TO BE RUN.
1544                                    ;EACH BIT SET REPRESENTS A PATTERN TABLE ENTRY THAT IS TO BE LEFT
1545                                    ;ALONE (TO BE RUN).  EACH BIT CLEARED REPRESENTS A PATTERN TABLE ENTRY
1546                                    ;THAT IS TO BE OVERLAYED WITH THE ADDRESS OF A NULL PATTERN.
1547 005376                            IF APTFLAG IS TRUE
      005376  005737  002444                                                    TST APTFLAG
      005402  001432                                                            BEQ L14
1548 005404  012700  07>220             MOV   #$DDW0,R0
1549 005410  012001                     MOV   (R0)+,R1
1550 005412  012703  020124             MOV   #MKCSRT,R3
1551 005416  004737  005472             CALL  PATPLUG
1552 005422  012001                     MOV   (R0)+,R1
1553 005424  004737  005472             CALL  PATPLUG
1554 005430  012001                     MOV   (R0)+,R1
1555 005432  012703  021402             MOV   #MKPAT,R3
1556 005436  004737  005472             CALL  PATPLUG
1557 005442  012001                     MOV   (R0)+,R1
1558 005444  004737  005472             CALL  PATPLUG
1559 005450  012001                     MOV   (R0)+,R1
1560 005452  012703  021600             MOV   #MJPAT,R3
1561 005456  004737  005472             CALL  PATPLUG
1562 005462  012001                     MOV   (R0)+,R1
1563 005464  004737  005472             CALL  PATPLUG
1564 005470                            END ;OF IF APTFLAG IS TRUE
      005470                                                    L14:::::::
1565 005470  000420                     BR      SUBAAA
1566
1567 005472                    PATPLUG:SUBTST  <<SUBR  PLUG IN NULL PATTERNS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    PLUG IN NULL PATTERNS
                                        ;*****************************************************************************
1568 005472                             FOR I :  #1 TO #16.
      005472  012737  000001  002602                                            MOV #1,I
      005500                                                    B0:::::::
1569 005500  006001                       ROR   R1
1570 005502                               ON.NOERROR            ;IF CARRY CLEAR
      005502  103402                                                            BCS L15
1571 005504  012713  025772                 MOV #MT0999,(R3)
1572 005510                               END :OF ON.ERROR
      005510                                                    L15:::::::
1573 005510  062703  000002               ADD #2,R3
1574 005514                            END ;OF FOR
      005514  005237  002602                                                    INC I
      005520  023727  002602  000020                                            CMP I,#16.
      005526  003764                                                            BLE B0
      005530                                                    E0:::::::
 >75 005530  000207                     RETURN
```

```
1578 005532                            SUBAAA: SUBTST  <<PROTECT PROGRAM & LOADERS>>
                                       ;*********************************************************************
                                       ;*SUBTEST       PROTECT PROGRAM & LOADERS
                                       ;*********************************************************************
1579 005532  052737  100000  003016          BIS     #BIT15,CONFIG           ;PROTECT PROGRAM SPACE (BANK 0)
1580 005540  052737  100000  003024          BIS     #BIT15,CONFIG+6         ;PROTECT LOADER SPACE (BANK 1)
1581 005546                              IF #$ENDAD NE 42 AND ONCE IS FALSE ;NOT ACT-11 AND NOT DONE ONCE?
     005546  022737  015000  000042                                                  CMP #$ENDAD,#42
     005554  001405                                                                 BEQ L16
     005556  005737  002732                                                        TST ONCE
     005562  001002                                                                BNE L16
1582 005564                                TYPE  MSG000                    ;TYPE PROGRAM TITLE
     005564  104401  111176              TYPEIT  ,MSG000
                                         .DSABL  CRF
1583 005570                              END ;OF IF #$ENDAD
     005570                                                                 L16:::::::
1584 005570                              SUBTST  <<MULTIPORT DETERMINATION ROUTINE>>
                                       ;*********************************************************************
                                       ;*SUBTEST       MULTIPORT DETERMINATION ROUTINE
                                       ;*********************************************************************
1585                                     ;DETERMINE
1586                                     ;1. IF WE ARE MULTIPROCESSING
1587                                     ;2. IF WE CAN USE THE IIST INTERFACE
1588                                     ;3. EACH CPU'S ID (IIST NUMBER OR SYSTEM ID REGISTER)
1589                                     .ENABL  LSB
1590 005570                              IF NOIIST IS TRUE
     005570  005737  002756                                                        TST NOIIST
     005574  001427                                                                BEQ L17
1591 005576                                IF ONCE IS FALSE
     005576  005737  002732                                                        TST ONCE
     005602  001005                                                                BNE L20
1592 005604                            1$:     TYPE    MSG080          ;ENTER # OF SLAVE CPU'S (0-3)?
     005604  104401  115520              TYPEIT  ,MSG080
                                         .DSABL  CRF
1593 005610  104413                        RDOCT                       ;READ AN OCTAL NUMBER ONTO THE STACK
1594 005612                                POP SLAVES
     005612  012637  002730                                                        MOV (SP)+,SLAVES
1595 005616                                END ;OF IF ONCE
     005616                                                                 L20:::::::
1596 005616                                IF SLAVES LT #0 OR SLAVES GT #3
     005616  005737  002730                                                        TST SLAVES
     005622  002404                                                                BLT L21
     005624  023727  002730  000003                                                CMP SLAVES,#3
     005632  003401                                                                BLE L22
     005634                                                                 L21:::::::
1597 005634  000763                           BR  1$
1598 005636                                END ;OF IF SLAVES
     005636                                                                 L22:::::::
1599 005636                                IF SLAVES EQ #0 THEN GOTO 2$
     005636  005737  002730                                                        TST SLAVES
     005642  001427                                                                BEQ 2$
1600 005644  013737  177764  002606          MOV   SYSTID,PORTDIR
1601 005652                              ELSE
     005652  000420                                                                BR L23
     005654                                                                 L17:::::::
1602 005654                                SET4  #2$               ;TRAPS TO 4 GOTO 2$
     005654  012737  005722  000004          MOV     #2$,4
```

```
                                        .DSABL  CRF
 1603 005662  012777  100000  175046      MOV    #BIT15,@IISTACR ;IS THERE AN IIST?
 1604 005670  017700  175042              MOV    @IISTACR,R0     ;YES - GET ID
 1605 005674  072027  177770              ASH    #-8.,R0
 1606 005700  042700  177774              BIC    #^C3,R0
 1607 005704  010037  002606              MOV    R0,PORTDIR      ;IDENTIFY MASTER
 1608 005710  005777  175024              TST    @IISTADR        ;SEE IF 2ND IIST REGISTER TRAPS
 1609 005714                            END ;OF IF NOIIST
      005714                                                                 L23:;;;;;;
 1610 005714                            SET     MULTIPORT       ;MULTIPORTING!
      005714  012737  177777  003014                                                  MOV  #-1,MULTIPORT
 1611 005722  013706  002706        2$:  MOV     KSTACK,SP
 1612 005726                            RES4                    ;RESET TRAPS TO 4 TO DEFAULT
      005726  012737  036726  000004    MOV     #TIMEOUT,4
      005734  005037  177766            CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                 ;THAT A EXPECTED TRAP COULD HAVE SET
                                        .DSABL  CRF
 1613 005740                            SET     ONCE
      005740  012737  177777  002732                                                  MOV  #-1,ONCE
 1614 005746  005037  002670            CLR     LOCK
 1615                                   .DSABL  LSB
```

```
1618 005752                          BEGIN:  SUBTST  <<SLAVES START HERE>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        SLAVES START HERE
                                     ;*****************************************************************************
1619 005752  000240                          NOP
1620 005754  005237  002670                  INC     LOCK            ;ONLY ONE CPU AT A TIME IS ALLOWED HERE
1621 005760                                  IF LOCK NE #1
     005760  023727  002670  000001                                                      CMP LOCK,#1
     005766  001402                                                                      BEQ L24
1622 005770  000000                  MHALT2:   HALT                          ;MULTIPLE CPU'S EXECUTING SAME CODE
1623 005772  000776                            BR      MHALT2
1624 005774                                  END ;OF IF LOCK
     005774                                                                  L24:;;;;;;;
1625 005774                                  IF CPUBIT NE #MASTER            ;IF I'M A SLAVE
     005774  023727  002114  000020                                                      CMP CPUBIT,#MASTER
     006002  001402                                                                      BEQ L25
1626 006004  004737  061244                    CALL  SLAVEMAP
1627 006010                                  END ;OF IF CPUBIT
     006010                                                                  L25:;;;;;;;
```

```
                        SUBTST  <<DETERMINE MK11 ACCESS METHOD>>
                ;*******************************************************************************
                ;*SUBTEST        DETERMINE MK11 ACCESS METHOD
                ;*******************************************************************************
                        ;DETERMINE HOW WE ACCESS THE MK11 CSR'S.
                        ;IF I CAN'T ACCESS THE CSR'S NORMALLY THEN I ASSUME THAT I MUST
                        ;RELOCATE THRU THE UNIBUS MAP SO I SET THE ''CSR'S RELOCATED'' FLAG (CSRREL)
                        ;NOTE:  I DON'T REALLY KNOW AT THIS POINT IF THERE IS ANY MK11 MEMORY YET
                        ;       I ONLY DETERMINE HOW I WILL HAVE TO ACCESS IT IF THERE IS ANY.
006010                  SET4    #5$             ;TRAPS TO 4 GOTO 5$
006010  012737  006036  000004  MOV     #5$,4
                        .DSABL  CRF
006016  012700  000010          MOV     #8.,R0                  ;TEST FOR 8 CSR'S
006022  012702  172100          MOV     #MK11ADD,R2             ;R2 = CSR ADDRESS
006026  005712          4$:     TST     (R2)                    ;ANSWER RO TRAP
006030  005037  002254          CLR     CSRREL                  ;ANSWER - CSR'S NOT RELOCATED
006034  000410                  BR      6$                      ;BRANCH - OUT
006036  062706  000004  5$:     ADD     #4,SP                   ;FIX STACK FROM TRAP
006042  062702  000004          ADD     #4,R2                   ;NEXT CSR = LAST CSR + 4
006046  077011                  SOB     R0,4$                   ;LOOP TILL DONE
006050                          SET     CSRREL
006050  012737  177777  002254                                          MOV  #-1,CSRREL
006056                  6$:     RES4                    ;PESET TRAPS TO 4 TO DEFAULT
006056  012737  036726  000004  MOV     #TIMEOUT,4
006064  005037  177766          CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                        ;THAT A EXPECTED TRAP COULD HAVE SET
                        .DSABL  CRF
006070                  SUBTST  <<SETUP USER & SUPERVISOR STACK>>
                ;*******************************************************************************
                ;*SUBTEST        SETUP USER & SUPERVISOR STACK
                ;*******************************************************************************
006070  104421          DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT

                        ;SET PREVIOUS MODE TO SUPERVISOR
006072  042737  030000  177776  BIC     #BIT13!BIT12,PSW
006100  052737  010000  177776  BIS     #BIT12,PSW

006106                  PUSH    #SUPSTK
006106  012746  000740                                          MOV #SUPSTK,-(SP)
006112  006606          MTPI    SSP

                        ;SET PREVIOUS MODE TO USER
006114  052737  030000  177776  BIS     #BIT13!BIT12,PSW

006122                  PUSH    #USESTK
006122  012746  000700                                          MOV #USESTK,-(SP
006126  006606          MTPI    USP
```

```
                                        SUBTST  <<GET SOFTWARE SWITCH REGISTER IF NECESSARY>>
                                ;*******************************************************************************
                                ;*SUBTEST        GET SOFTWARE SWITCH REGISTER IF NECESSARY
                                ;*******************************************************************************
                                        IF CPUBIT EQ #MASTER AND $AUTO IS FALSE ;IF MASTER & NOT (APT OR ACT)
006130  023727  002114  000020                                                  CMP CPUBIT,#MASTER
006136  001010                                                                  BNE L26
006140  005737  002066                                                          TST $AUTO
006144  001005                                                                  BNE L26
                                          IF SWR EQ #SWREG              ;IF SOFTWARE SWITCH REG SELECTED
006146  023727  002766  000176                                                  CMP SWR,#SWREG
006154  001001                                                                  BNE L27
006156  104407                            GTSWR                               ;;GET SOFT-SWR SETTINGS
006160                                    END ;OF IF SWR
006160                                                                  L27:::::::
                                        END ;OF IF CPUBIT
006160                                                                  L26:::::::
                                        SUBTST  <<SETUP UNIBUS MAP>>
                                ;*******************************************************************************
                                ;*SUBTEST        SETUP UNIBUS MAP
                                ;*******************************************************************************
006172  012737  000077  170372        MOV     #77,MAPH36              ;MAP36 IS USED TO ACCESS MK11 CSR'S ON PDP11-70'S
006200  012737  160000  170370        MOV     #160000,MAPL36          ;THAT DO NOT HAVE THE MULTIPROCESSOR MODIFICATIONS.
006206                                CLEAR   MAPH0,MAPL0             ;MAP0 IS USED FOR APT TO LOOK AT THE MAILBOX THRU.
006206  005037  170202                                                          CLR  MAPH0
006212  005037  170200                                                          CLR  MAPL0
006216  004737  042026                CALL    LOWMAP                  ;SETUP LOWER UNIBUS MAP
006222  052737  000040  172516        BIS     #BIT5,MMR3              ;ENERGIZE UNIBUS MAP
                                        SUBTST  <<GET MEMORY MANAGEMENT READY>>
                                ;*******************************************************************************
                                ;*SUBTEST        GET MEMORY MANAGEMENT READY
                                ;*******************************************************************************
                                        IF CPUBIT EQ #MASTER
006230  023727  002114  000020                                                  CMP CPUBIT,#MASTER
006236  001001                                                                  BNE L30
006240  104422                            KMAP                        ;MAP KERNEL SPACE 1 TO 1
                                        END ;OF IF CPUBIT
006242                                                                  L30:::::::
                                        MAP                             ;MAP SUPERVISOR SPACE (TEST AREA) 1 TO 1
006242  010346                                                                  MOV R3,-(SP)
006244  012703  000170                MOV     #120.,R3
006250  004737  040700                CALL    MAPPER
                                        .DSABL  CRF
006254  012603                                                                  MOV (SP)+,R3
006256  104420                        ENERGIZE                        ;TURN ON MEMORY MANAGEMENT
```

```
 1689 006260                                    NEWTST  <<ANALIZE CONFIGURATION>>
                                        ;*****************************************************************************
                                        ;*TEST 1         ANALIZE CONFIGURATION
                                        ;*****************************************************************************
      006260  000004                    TST1:   SCOPE
 1690                                           ;THIS CODE DOES THE FOLLOWING FOR MK11 CSR'S
 1691                                           ;1. FINDS ANY EXISTING CSR'S - SETTING BITS IN LOC 'MKCSRS' FOR
 1692                                           ;   EACH ONE PRESENT.
 1693                                           ;2. SETS A BIT IN LOC 'MKCSRS' FOR ANY MK11 THAT IS INTERNALLY INTERLEAVED
 1694                                           ;3. DETERMINES THE INTERLEAVE FACTOR & STARTING ADDRESS.  USING THIS
 1695                                           ;   WE DETERMINE THE FIRST & LAST BANK INCLUDED IN THIS CSR.  USING THAT
 1696                                           ;   THE CONFIGURATION TABLE IS UPDATED TO
 1697                                           ;       A. IDENTIFY BANKS WITHIN THE RANGE AS MK11 MEMORY.
 1698                                           ;       B. IDENTIFY BANKS WITHIN THE RANGE WITH INTERLEAVE FACTOR.
 1699                                           ;       C. IF NO EXTERNAL INTERLEAVE IDENTIFY BANKS WITHIN THE RANGE
 1700                                           ;          AS CONTROLLED BY THIS CSR
 1701                                           ;       D. IDENTIFY BANKS WITHIN THE RANGE BY A SPECIFIC BIT POSITION
 1702                                           ;          FOR THIS CSR
 1703 006262  005037  002256                    CLR     CSRNO                   ;1ST CSR IS 0
 1704 006266                                    PUSH    CONTRL                  ;SAVE CACHE STATUS
      006266  013746  177746                                                                  MOV CONTRL,-(SP)
 1705 006272                                    SET4    #CONFGT         ;TRAPS TO 4 GOTO CONFGT
      006272  012737  006666  000004            MOV     #CONFGT,4
                                                .DSABL  CRF
 1706 006300  010637  006754                    MOV     SP,CONFSP               ;SAVE STACK
 1707 006304  006337  002334            CONFG1: ASL     MKCSRS
 1708 006310  006337  002330                    ASL     PENDBOX
 1709 006314  104426                            READCSR                         ;TRAP IF IT DOES NOT EXIST
 1710 006316  052737  000001  002334            BIS     #1,MKCSRS               ;MARK CSR AS PRESENT
 1711 006324  005001                            CLR     R1
 1712 006326  013700  002146                    MOV     CSR+2,R0
 1713 006332  072027  177765                    ASH     #-11.,R0
 1714 006336  042700  177770                    BIC     #^C7,R0
 1715 006342                                    IF #BIT0 SET.IN R0 THEN LET MKCSRS := MKCSRS SET.BY #BIT8
      006342  032700  000001                                                            BIT #BIT0,R0
      006346  001403                                                                    BEQ L31
      006350  052737  000400  002334                                                    BIS #BIT8,MKCSRS
      006356                                                                  L31:;;;;;;
 1716 006356                                    CASE R0
      006356  010046                                                                    MOV R0,-(SP)
      006360  006316                                                                    ASL @SP
      006362  004737  006406                                                            JSR PC,L32
 1717 006366  006756                              INTER0
 1718 006370  006760                              INTER1
 1719 006372  006760                              INTER2
 1720 006374  006766                              INTER3
 1721 006376  006766                              INTER4
 1722 006400  006774                              INTER5
 1723 006402  006766                              INTER6
 1724 006404  006774                              INTER7
 1725 006406                                    END ;OF CASE R0
      006406                                                                  L32:;;;;;;
      006406  062616                                                                    ADD (SP)+,@SP
      006410  013646                                                                    MOV @(SP)+,-(SP)
      006412  004736                                                                    JSR PC,@(SP)+
 1726 006414  010137  002264                    MOV     R1,INTERL               ;SET INTERLEAVE FACTOR
 1727 006420  004737  017736                    CALL    GETSIZE
```

```
                                        ;THE NEXT 6 LINES SAVE THE READ STATUS OF THE BOX CAPACITY
1729 006424 013701 002256               MOV     CSRNO,R1
1730 006430 006201                      ASR     R1
1731 006432 013761 002144 002154        MOV     CSR,CSR0(R1)
1732 006440 013761 002146 002174        MOV     CSR+2,CSR2(R1)
1733 006446 013761 002260 002214        MOV     FIRSTB,CSRFB(R1)
1734 006454                             IF FIRSTB GT #167
     006454 023727 002260 000167                                                CMP FIRSTB,#167
     006462 003405                                                              BLE L33
1735 006464 052737 000001 002330          BIS #BIT0,PENDBOX
1736 006472 000137 006712                 JMP   CONFG5
1737 006476                             END ;OF IF FIRSTB
     006476                                                             L33:::::::
1738 006476 013761 002262 002234        MOV     LASTB,CSRLB(R1)
1739 006504 013701 002260               MOV     FIRSTB,R1
1740 006510 070127 000006              MUL     #6,R1                   ;R1 = BANK * 6
1741 006514 010137 002110               MOV     R1,BANKINDEX
1742 006520 013701 002110       CONFG3: MOV     BANKINDEX,R1            ;GET NEXT INDEX (SAME FIRST TIME)
1743 006524 053761 002264 003016        BIS     INTERL,CONFIG(R1)       ;SETUP INTERLEAVE BITS
1744 006532 052761 020000 003016        BIS     #BIT13,CONFIG(R1)       ;IDENTIFY AS MK11
1745 006540 042761 040000 003016        BIC     #BIT14,CONFIG(R1)
1746 006546                             IF #BIT8 SET.IN MKCSRS
     006546 032737 000400 002334                                                BIT #BIT8,MKCSRS
     006554 001403                                                              BEQ L34
1747 006556 052761 010000 003020          BIS   #BIT12,CONFIG+2(R1)
1748 006564                             END ;OF IF #BIT8
     006564                                                             L34:::::::
1749 006564 013700 002256               MOV     CSRNO,R0                ;GET CSR LSB'S
1750 006570 072027 177776               ASH     #-2,R0                  ;MAKE (0-7)
1751 006574                             IF #BIT13!BIT12 SET.IN CSR+2    ;ANY EXTERNAL INTERLEAVE?
     006574 032737 030000 002146                                                BIT #BIT13!BIT12,CSR+2
     006602 001404                                                              BEQ L35
1752 006604 052761 000010 003016          BIS   #BIT3,CONFIG(R1)        ;IDENTIFY IT
1753 006612                             ELSE
     006612 000406                                                              BR L36
     006614                                                             L35:::::::
1754 006614                               PUSH  R0
     006614 010046                                                              MOV R0,-(SP)
1755 006616 072027 000010                 ASH   #8.,R0                  ;MOVE TO BITS 10-8
1756 006622 050061 003016                 BIS   R0,CONFIG(R1)           ;IDENTIFY AS CSR & BOX NUMBER
1757 006626                               POP   R0
     006626 012600                                                              MOV (SP)+,R0
1758 006630                             END ;OF IF #BIT13!BIT12
     006630                                                             L36:::::::
1759 006630 012702 000001               MOV     #1,R2
1760 006634 072200                      ASH     R0,R2                   ;R2 = 1,2,4,10,20,40,100, OR 200
1761 006636 050261 003022               BIS     R2,CONFIG+4(R1)         ;SETUP CSR WORD
1762 006642 062737 000006 002110        ADD     #6,BANKINDEX            ;NEXT TABLE ENTRY
1763 006650 005237 002260               INC     FIRSTB
1764 006654 023737 002260 002262        CMP     FIRSTB,LASTB            ;DONE?
1765 006662 101716                      BLOS    CONFG3                  ;NO - LOOP
1766 006664 000412                      BR      CONFG5
1767 006666 013706 006754       CONFGT: MOV     CONFSP,SP               ;FIX STACK FROM MULTIPLE TRAP
1768 006672                             IF #BIT4 OFF.IN CPUERR
     006672 032737 000020 177766                                                BIT #BIT4,CPUERR
     006700 001004                                                              BNE L37
1769 006702                               LET GOOD := #BIT4
```

```
      006702  012737  000020  002050                                                  MOV #BIT4,GOOD
1770  006710  104037                          ERROR +37
1771  006712                               END ;OF IF CPUERR
      006712                                                                  L37:;;;;;;
1772  006712  062737  000004  002256  CONFG5: ADD     #4,CSRNO                ;BUMP CSR
1773  006720                               IF CSRNO NE #40 THEN JUMPTO CONFG1
      006720  023727  002256  000040                                                  CMP CSRNO,#40
      006726  001402                                                                 BEQ L40
      006730  000137  006304                                                        JMP CONFG1
      006734                                                                  L40:;;;;;;
1774  006734                               RES4                                    ;RESET TRAPS TO 4 TO DEFAULT
      006734  012737  036726  000004          MOV     #TIMEOUT,4
      006742  005037  177766                CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                    ;THAT A EXPECTED TRAP COULD HAVE SET
                                           .DSABL  CRF
1775  006746                               POP     CONTRL                          ;RESTORE CACHE STATUS
      006746  012637  177746                                                        MOV (SP)+,CONTRL
1776  006752  000413                      BR      SUBAAS
1777  006754  000000                CONFSP: 0                                       ;STACK SAVED HERE!
1778
1779                                       ;TOTAL INTERLEAVE (0, 2-1, 4-1, OR 8-1)
1780  006756  000207                INTER0: RETURN                                  ;NO INTERLEAVE
1781
1782  006760                         INTER1:
1783  006760  012701  000001        INTER2: MOV     #1,R1                           ;2 WAY INTERLEAVE
1784  006764  000207                        RETURN
1785
1786  006766                         INTER3:
1787  006766                         INTER4:
1788  006766  012701  000002        INTER6: MOV     #2,R1                           ;4 WAY INTERLEAVE
1789  006772  000207                        RETURN
1790
1791  006774                         INTER5:
1792  006774  012701  000004        INTER7: MOV     #4,R1                           ;8 WAY INTERLEAVE
1793  007000  000207                        RETURN
```

```
1795 007002  104472                SUBAAS: ECCINIT          ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
1796 007004                                NEWTST  <<TEST BANK 0 ACCESSES>>
                                   ;*****************************************************************************
                                   ;*TEST 2        TEST BANK 0 ACCESSES
                                   ;*****************************************************************************
     007004  000004                TST2:   SCOPE
1797                               ;THIS DOES A "TST" INSTRUCTION ON EVERY LOCATION IN BANK #0 TO SEE
1798                               ;IF IT GETS ANY PARITY TRAPS.
1799                               ;SINCE EVERY LOCATION IS EITHOR LOADED OR WRITTEN INTO BY THE PROGRAM
1800                               ;PRIOR TO THIS POINT - THEN A PARITY ERROR IMPLIES THAT THERE IS A
1801                               ;HARDWARE FAILURE IN THE MEMORY.
1802                               ;THESE ERRORS ARE COUNTED AND A FATAL ACTION IS TAKEN
1803 007006  005037  002074                CLR     PARCNT                  ;CLEAR PARITY ERROR COUNTER
1804 007012  012737  000001  002100        MOV     #1,NOPAR                ;SET THE NO PARITY ERROR FLAG
1805 007020  005037  002072                CLR     NEMCNT                  ;CLEAR NON-EXISTANT MEMORY ERROR COUNTER
1806 007024  012737  000001  002102        MOV     #1,NONEM                ;SET THE NON-EXISTANT MEMORY ERROR MODE TO COUNT
1807 007032                                SET4    #NONEXIST       ;TRAPS TO 4 GOTO NONEXIST
     007032  012737  036646  000004        MOV     #NONEXIST,4
                                           .DSABL  CRF
1808 007040  005000                        CLR     R0
1809 007042  012701  040000                MOV     #SIZE,R1
1810 007046  104424                        CACHOFF                 ;TURN CACHE OFF
1811 007050  005720                1$:     TST     (R0)+                   ;SEE IF I CAN DO A READ ACCESS WITHOUT A PARITY TRAP
1812 007052  077102                        SOB     R1,1$
1813 007054  104423                        CACHON                  ;TURN CACHE ON
1814                                       ;SEE IF ANY FAILURES
1815 007056  005737  002074                TST     PARCNT                  ;ANY PARITY ERRORS?
1816 007062  001403                        BEQ     2$                      ;NO - SKIP
1817 007064                                FATAL   3
     007064  005237  002070                INC     FATAL$                  ;SET FATAL INDICATOR
     007070  104003                        ERROR   +3
                                           .DSABL  CRF
1818 007072  005737  002072        2$:     TST     NEMCNT                  ;ANY NON-EXISTANT MEMORY (HOLES)?
1819 007076  001406                        BEQ     3$                      ;SKIP IF EQUAL
1820 007100  162737  000002  002040        SUB     #2,ADDRESS              ;UPDATE 1ST ADDRESS FAILURE FROM AUTO INCREMENT #
1821 007106                                FATAL   4
     007106  005237  002070                INC     FATAL$                  ;SET FATAL INDICATOR
     007112  104004                        ERROR   +4
                                           .DSABL  CRF
1822 007114  053737  002114  003016  3$:     BIS     CPUBIT,CONFIG           ;SET CORRECT ACCESSED BIT ON BANK 0
1823 007122                                RES4                    ;RESET TRAPS TO 4 TO DEFAULT
     007122  012737  036726  000004        MOV     #TIMEOUT,4
     007130  005037  177766                CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                    ;THAT A EXPECTED TRAP COULD HAVE SET
                                           .DSABL  CRF
1824
1825 007134                                SUBTST  <<ENABLE MK11 FOR CORRECT TRAPS>>
                                   ;*****************************************************************************
                                   ;*SUBTEST       ENABLE MK11 FOR CORRECT TRAPS
                                   ;*****************************************************************************
1826 007134                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
     007134  032777  000001  173624                                                     BIT #SW0,@SWR
     007142  001003                                                                     BNE L41
     007144  005737  002442                                                             TST ACTFLAG
     007150  001402                                                                     BEQ L42
     007152                                                                 L41:::::::
1827 007152  104506                          ENASBE                ;TRAP ON SINGLE BIT ERRORS
```

```
                                        ELSE
                                                                                BR L43
007154  000401
007156
                                                                        L42:::::::
1829 007156  104472                       ECCINIT                ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
1830 007160                             END ;OF IF #SW0
007160
                                                                        L43:::::::
```

```
1833 007160                                    NEWTST  <<TEST BANKS 1-167 (OCTAL) FOR ZEROS & ONES>>
                                       ;*********************************************************************
                                       ;*TEST 3        TEST BANKS 1-167 (OCTAL) FOR ZEROS & ONES
                                       ;*********************************************************************
     007160  000004                    TST3:   SCOPE
1834                                           ;EACH BANK IS TESTED FOR EXISTANCE AND IF IT EXISTS
1835                                           ;THEN IS IS TESTED FOR ZEROS & ONES.
1836                                           ;EXCEPT -
1837                                           ;       PROTECTED BANKS (WHERE THE PROGRAM IS) ARE ONLY TESTED BY
1838                                           ;       "TST" INSTRUCTIONS LIKE BANK #0
1839                                           ;ANY BAD BANKS ARE LOGGED IN THE CONFIGURATION TABLE.
1840                                           ;ANY ERROR HERE WILL FORCE THE CONFIGURATION TABLE TYPEOUT.
1841                                           ;THIS ROUTINE IS ONLY DOING A SMART SIZE - NOT ACTUAL TESTING
1842 007162  005037  002106                   CLR     BANK
1843 007166  012737  000001  002100           MOV     #1,NOPAR                ;SET NO PARITY ERROR FLAG
1844 007174  012737  000002  002102           MOV     #2,NONEM                ;SET NON-EXISTANT MEMORY MODE TO EXIT TEST LOOP
1845 007202                                    SET4    #NONEXIST       ;TRAPS TO 4 GOTO NONEXIST
     007202  012737  036646  000004           MOV     #NONEXIST,4
                                               .DSABL  CRF
1846 007210                                    BMOV    MTP000                  ;PUT IN FAST MEMORY
     007210  004537  043710                        JSR R5,BLOCK1
     007214  026376                               MTP000
                                                  .DSABL      CRF
1847 007216  012737  005237  177654           MOV     #005237,UIPAR6  ;PUT "INC " INSTRUCTION IN SUBROUTINE
1848 007224  012737  002076  177656           MOV     #PATERR,UIPAR7  ;PUT IN ADDRESS OF OPERAND FOR ABOVE
1849 007232  005237  002106           TAG9$:  INC     BANK
1850 007236  022737  000170  002106           CMP     #120.,BANK              ;DONE?
1851 007244  001450                           BEQ     TAG2$                   ;YES - SKIP TO NEXT TEST
1852 007246  013701  002106                   MOV     BANK,R1
1853 007252  070127  000006                   MUL     #6,R1                   ;BANK*3*2
1854 007256  010137  002110                   MOV     R1,BANKINDEX
1855 007262  005037  002076                   CLR     PATERR                  ;CLEAR PATTERN ERROR COUNTER
1856 007266  005037  002074                   CLR     PARCNT                  ;CLEAR PARITY ERROR COUNTER
1857 007272  005037  002072                   CLR     NEMCNT                  ;CLEAR NON-EXISTANT MEMORY COUNTER (HOLES)
1858 007276                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
     007276  010346                                                                    MOV R3,-(SP)
     007300  013703  002106                   MOV     BANK,R3
     007304  004737  040700                   CALL    MAPPER
                                               .DSABL  CRF
     007310  012603                                                                   MOV (SP)+,R3
1859 007312  005761  003013                   TST     CONFIG(R1)              ;IS THIS BANK PROTECTED?
1860 007316  100533                           BMI     TSTBANK                 ;YES - GO TEST BANK SPECIAL
1861 007320  012737  000207  177644  WARN1:  MOV     #207,UIPAR2             ;PUT "RETURN" INSTRUCTION AFTER WRITE ROUTINE
1862 007326  012700  060000                   MOV     #FIRST,R0
1863 007332  010004                           MOV     R0,R4
1864 007334  012701  040000                   MOV     #SIZE,R1
1865 007340  010103                           MOV     R1,R3
1866 007342  005002                           CLR     R2                      ;DATA IS ZEROS
1867 007344  104424                           CACHOFF                 ;TURN CACHE OFF
1868 007346                                    SUPERVISOR                      ;ENTER SUPERVISOR MODE
     007346  052737  040000  177776           BIS     #BIT14,PSW              ;DO IT TO IT!
                                               .DSABL  CRF
1869 007354  004737  177640                   CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
1870 007360  104417                           KERNEL                  ;ENTER KERNEL MODE
1871 007362  104423                           CACHON                  ;TURN CACHE ON
1872 007364  000412                           BR      TAG3$                   ;SKIP NEXT INSTRUCTION
1873 007366  005037  002106           TAG2$:  CLR     BANK
```

```
1874 007372                                    RES4                    ;RESET TRAPS TO 4 TO DEFAULT
     007372  012737  036726  000004            MOV     #TIMEOUT,4
     007400  005037  177766                    CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                        ;THAT A EXPECTED TRAP COULD HAVE SET
                                                .DSABL  CRF
1875 007404  005037  002100                    CLR     NOPAR                   ;INDICATE DEFAULT PARITY ACTION
1876 007410  000543                            BR      SUBAAQ
1877 007412  005737  002072            TAG3$:  TST     NEMCNT                  ;ANY TRAPS?
1878 007416  001401                            BEQ     1$                      ;NO - SKIP
1879 007420  000704                            BR      TAG9$                   ;NOW - TRY NEXT BANK
1880 007422  104424                    1$:     CACHOFF                 ;TURN CACHE OFF
1881 007424                                    SUPERVISOR                      ;ENTER SUPERVISOR MODE
     007424  052737  040000  177776            BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
1882 007432  004737  177646                    CALL    UIPAR3                  ;FINISH PATTERN
1883 007436  104417                            KERNEL          ;ENTER KERNEL MODE
1884 007440  104423                            CACHON                  ;TURN CACHE ON
1885 007442  005737  002076                    TST     PATERR                  ;ANY PATTERN ERRORS
1886 007446  001031                            BNE     2$                      ;YES - SKIP
1887 007450  005737  002074                    TST     PARCNT                  ;ANY PARITY ERRORS
1888 007454  001026                            BNE     2$                      ;YES - SKIP
1889 007456  005737  002072                    TST     NEMCNT                  ;ANY NON EXISTANT MEMORY
1890 007462  001023                            BNE     2$                      ;YES - SKIP
1891 007464  012700  060000                    MOV     #FIRST,R0
1892 007470  010004                            MOV     R0,R4
1893 007472  012701  040000                    MOV     #SIZE,R1
1894 007476  010103                            MOV     R1,R3
1895 007500  013702  002726                    MOV     ONES,R2                 ;DATA IS ONES
1896 007504  012737  000240  177644            MOV     #000240,UIPAR2          ;PUT "NOP" INSTRUCTION BACK IN SUBROUTINE
1897 007512  104424                            CACHOFF                 ;TURN CACHE OFF
1898 007514                                    SUPERVISOR                      ;ENTER SUPERVISOR MODE
     007514  052737  040000  177776            BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
1899 007522  004737  177640                    CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
1900 007526  104417                            KERNEL          ;ENTER KERNEL MODE
1901 007530  104423                            CACHON                  ;TURN CACHE ON
1902 007532  013700  002110            2$:     MOV     BANKINDEX,R0
1903 007536  005737  002076                    TST     PATERR                  ;ANY PATTERN ERRORS?
1904 007542  001006                            BNE     3$                      ;YES - SKIP
1905 007544  005737  002074                    TST     PARCNT                  ;ANY PARITY ERRORS?
1906 007550  001003                            BNE     3$                      ;YES - SKIP
1907 007552  005737  002072                    TST     NEMCNT                  ;ANY HOLES?
1908 007556  001406                            BEQ     4$                      ;NONE - SKIP
1909 007560  052760  004000  003016    3$:     BIS     #BIT11,CONFIG(R0)       ;SET ERROR BIT IN THIS BANK
1910 007566                                    SET     CONFGERROR              ;FORCE PRINTING OF CONFIGURATION TABLE
     007566  012737  177777  002576                                                    MOV  #-1,CONFGERROR
1911 007574  053760  002114  003016    4$:     BIS     CPUBIT,CONFIG(R0)       ;SET ACCESSED BIT
1912 007602  000137  007232                    JMP     TAG9$
1913
1914                                           ;TEST A PROTECTED BANK
1915 007606                            TSTBANK:PUSH    R1                                              MOV R1,-(SP)
     007606  010146
1916 007610  012737  000001  002102            MOV     #1,NONEM                ;SET NON-EXISTANT MEMORY TO COUNT
1917 007616  012700  060000                    MOV     #FIRST,R0
1918 007622  012701  040000                    MOV     #SIZE,R1
1919 007626  104424                            CACHOFF                 ;TURN CACHE OFF
1920 007630                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
```

```
        007630  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT T  IT
                                                .DSABL  CRF
  1921  007636  005720                  4$:     TST     (R0)+
  1922  007640  077102                          SOB     R1,4$
  1923  007642  104417                          KERNEL                  ;ENTER KERNEL MODE
  1924  007644  104423                          CACHON                  ;TURN CACHE ON
  1925  007646  012737  000002  002102          MOV     #2,NONEM                ;RESET NON-EXISTANT MEMORY TO EXIT TEST LOOP
  1926  007654                                  POP     R1
        007654  012601                                                          MOV (SP)+,R1
  1927  007656                                  IF PARCNT NE #0
        007656  005737  002074                                                  TST PARCNT
        007662  001406                                                          BEQ L44
  1928  007664  052761  004000  003016            BIS   #BIT11,CONFIG(R1)       ;ERROR BANK
  1929  007672                                    SET   CONFGERROR              ;FORCE PRINTING OF CONFIGURATION TABLE
        007672  012737  177777  002576                                          MOV  #-1,CONFGERROR
  1930  007700                                  END ;OF IF PARCNT
        007700                                                          L44.::::::
  1931  007700                                  IF NEMCNT EQ #0
        007700  005737  002072                                                  TST NEMCNT
        007704  001003                                                          BNE L45
  1932  007706  053761  002114  003016            BIS   CPUBIT,CONFIG(R1)       ;ACCESSED BANK
  1933  007714                                  END ;OF IF NEMCNT
        007714                                                          L45:::::::
  1934  007714  000137  007232                  JMP     TAG9$
```

```
1937 007720                          SUBAAQ: SUBTST  <<DETERMINE PROTECTED BANKS>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       DETERMINE PROTECTED BANKS
                                     ;*****************************************************************************
1938                                         ;THE MK11 INHIBITS ECC DISABLE (AND OTHER THINGS) ON THE BOTTOM
1939                                         ;16K WORDS OF EACH CONTROLLER (2 PER BOX).
1940                                         ;THIS IS CONSIDERED TO BE A PROTECTED BANK BY THE PROGRAM.
1941                                         ;USUALLY (ON A SINGLE BOX SYSTEM WITH 4K MOS RAMS) THIS IS BANKS #0 & #2
1942                                         ;HOWEVER IT MAY BE QUITE COMPLEX TO DETERMINE ON A GIVEN SYSTEM
1943                                         ;CONFIGURATION (MIXED MK11,MJ11;  MIXED 4K MOS, 16K MOS;  MULTIPLE MK11
1944                                         ;BOXES;  MIXED INTERLEAVE SCHEMES) WHICH BANKS ARE PROTECTED.
1945                                         ;SO
1946                                         ;THIS ROUTINE ATTEMPS TO CREATE A DOUBLE BIT ERROR IN ADDRESS #0 & #2
1947                                         ;OF EVERY MK11 BANK.  MK11 HARDWARE WILL PREVENT THIS FROM HAPPENING
1948                                         ;IN PROTECTED BANKS WHICH SHOULD ALWAYS INCLUDE BANK ZERO - WHERE THE
1949                                         ;PROGRAM IS.
1950                                         ;
1951                                         ;WARNING:!!!!!!
1952                                         ;  IN CASE OF HARDWARE FAILURE IT IS COMMON THAT A DOUBLE BIT ERROR
1953                                         ;  WILL BE CREATED ON THE KERNEL STACK & "CRASH" THE DIAGNOSTIC DURING
1954                                         ;  THIS ROUTINE.  YOUR ONLY CLUE IS THAT YOU CAN GET AS FAR AS THIS
1955                                         ;  ROUTINE BUT NOT PAST IT!
1956 007720  000004                         SCOPE
1957 007722  104424                         CACHOFF                 ;TURN CACHE OFF
1958 007724  005037  002122                 CLR     KPFLAG
1959 007730  012701  060000                 MOV     #FIRST,R1
1960 007734  005004                         CLR     R4
1961 007736                                 FOR BANK := #0 TO #167
     007736  005037  002106                                                     CLR BANK
     007742                                                             B1:::::::
1962 007742  013703  002106                   MOV   BANK,R3
1963 007746  070327  000006                   MUL   #6,R3
1964 007752  010337  002110                   MOV   R3,BANKINDEX
1965 007756                                   IF CPUBIT SET.IN CONFIG(R3) ;IF ACCESSABLE
     007756  033763  002114  003016                                             BIT CPUBIT,CONFIG(R3)
     007764  001520                                                           BEQ L46
1966 007766                                     IF #BIT13 SET.IN CONFIG(R3) AND #BIT14 OFF.IN CONFIG(R3) ;IF MK11
     007766  032763  020000  003016                                           BIT #BIT13,CONFIG(R3)
     007774  001514                                                           BEQ L47
     007776  032763  040000  003016                                           BIT #BIT14,CONFIG(R3)
     010004  001110                                                           BNE L47
1967 010006                                       MAP BANK                  ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
     010006  010346                                                         MOV R3,-(SP)
     010010  013703  002106                 MOV     BANK,R3
     010014  004737  040700                 CALL    MAPPER
                                            .DSABL  CRF
     010020  012603                                                         MOV (SP)+,R3
1968 010022  005037  002144                       CLR       CSR
1969 010026                                       SUPERVISOR                ;ENTER SUPERVISOR MODE
     010026  052737  040000  177776         BIS     #BIT14,PSW              ;DO IT TO IT!
                                            .DSABL  CRF
1970 010034                                       PUSH      FIRST,FIRST+2   ;SAVE TWO TEST LOCATIONS
     010034  013746  060000                                                   MOV FIRST,-(SP)
     010040  013746  060002                                                   MOV FIRST+2,-(SP)
1971 010044  104504                               CHKDIS                    ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
1972 010046  010411                               MOV       R4,(R1)                 ;WRITE CHECKBITS (ALL ZEROS)
1973 010050  010461  000002                       MOV       R4,2(R1)
```

```
1974 010054  104502                    CLRCSR                  ;CLEAR MK11 CSRS
1975 010056  005711                    TST     (R1)                    ;READ CHECKBITS INTO REAL CSR
1976 010060  104500                    WASDBE                  ;WAS THERE A DOUBLE BIT ERROR
1977                                   ;THIS MAKES SURE THAT SBE'S DON'T LOOK LIKE PROTECTED AREAS
1978 010062                            ON.NOERROR ;1
     010062  103441                                                    BCS L50
1979 010064  005037  002144              CLR     CSR
1980 010070  104504                      CHKDIS                ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'S
1981 010072  013711  002726              MOV     ONES,(R1)
1982 010076  013761  002726  000002      MOV     ONES,2(R1)
1983 010104  104502                      CLRCSR                ;CLEAR MK11 CSRS
1984 010106  005711                      TST     (R1)
1985 010110  104500                      WASDBE                ;WAS THERE A DOUBLE BIT ERROR
1986 010112                              ON.NOERROR ;2
     010112  103425                                                    BCS L51
1987 010114  012737  007400  002144        MOV   #7400,CSR
1988 010122  104504                        CHKDIS                      ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'
1989 010124  010411                        MOV   R4,(R1)
1990 010126  010461  000002                MOV   R4,2(R1)
1991 010132  104502                        CLRCSR                      ;CLEAR MK11 CSRS
1992 010134  005711                        TST   (R1)
1993 010136  104500                        WASDBE                      ;WAS THERE A DOUBLE BIT ERROR
1994 010140                                ON.NOERROR ;3
     010140  103412                                                          BCS L52
1995 010142  012737  074000  002144          MOV #74000,CSR
1996 010150  104504                        CHKDIS                      ;DISABLE ECC & WRITE CHECKBITS FROM ALL CSR'
1997 010152  010411                        MOV R4,(R1)
1998 010154  010461  000002                MOV R4,2(R1)
1999 010160  104502                        CLRCSR                      ;CLEAR MK11 CSRS
2000 010162  005711                        TST (R1)
2001 010164  104500                        WASDBE                      ;WAS THERE A DOUBLE BIT ERROR
2002 010166                              END ;OF ON.NOERROR ;3
     010166                                                          L52:::::::
2003 010166                            END ;OF ON.NOERROR ;2
     010166                                                          L51:::::::
2004 010166                            END ;OF ON.NOERROR ;1
     010166                                                          L50:::::::
2005 010166                            ON.NOERROR
     010166  103405                                                          BCS L53
2006                                     ;MARK PROTECTED BANK
2007 010170  013703  002110              MOV     BANKINDEX,R3
2008 010174  052763  010000  003016      BIS     #BIT12,CONFIG(R3)   ;IDENTIFY AS PROTECTED BY MK11
2009 010202                            END ;OF ON.NOERROR
     010202                                                          L53:::::::
2010 010202  104470                    ECCDIS                  ;DISABLE ERROR CORRECTION
2011 010204  010411                    MOV     R4,(R1)         ;CLEAR OUT DOUBLE BIT ERROR.
2012 010206  010461  000002            MOV     R4,2(R1)        ;CLEAR OUT DOUBLE BIT ERROR!
2013 010212  104502                    CLRCSR
2014 010214                            POP     FIRST+2,FIRST   ;RESTORE TWO TEST LOCATIONS
     010214  012637  060002                                            MOV (SP)+,FIRST+2
     010220  012637  060000                                            MOV (SP)+,FIRST
2015 010224  104417                      KERNEL                ;ENTER KERNEL MODE
2016 010226                            END ;OF IF #BIT3
     010226                                                          L47:::::::
2017 010226                          END ;OF IF CPUBIT
     010226                                                          L46:::::::
2018 010226                        END ;OF FOR BANK
```

```
                010226  005237  002106                                                  INC BANK
                010232  023727  002106  000167                                          CMP BANK,#167
                010240  003640                                                          BLE B1
                010242                                                              E1:::::::
2019            010242                          MAP                 ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
                010242  010346                                                          MOV R3,-(SP)
                010244  012703  000170          MOV     #120.,R3
                010250  004737  040700          CALL    MAPPER
                                                .DSABL  CRF
                010254  012603                                                          MOV (SP)+,R3
2020            010256  005037  002106          CLR     BANK
2021
2022            010262                          IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
                010262  032777  000001  172476                                        BIT #SW0,@SWR
                010270  001003                                                        BNE L54
                010272  005737  002442                                                TST ACTFLAG
                010276  001402                                                        BEQ L55
                010300                                                          L54:::::::
2023            010300  104506                    ENASBE                ;TRAP ON SINGLE BIT ERRORS
2024            010302                          ELSE
                010302  000401                                                        BR L56
                010304                                                          L55:::::::
2025            010304  104472                    ECCINIT               ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
2026            010306                          END ;OF IF #SW0
                010306                                                          L56:::::::
2027
2028            010306  104423                  CACHON                  ;TURN CACHE ON
```

```
2031 010310                                    NEWTST  <<MK11 PROTECTION POINTER TEST>>
                                       ;*****************************************************************************
                                       ;*TEST 4        MK11 PROTECTION POINTER TEST
                                       ;*****************************************************************************
     010310  000004                    TST4:   SCOPE
2032                                           ;INSURE THAT BOTTOM OF MK11 WAS PROTECTED WITH PROTECTION POINTER CLEAR
2033 010312                                    BEGIN PROTECTIONTEST
     010312                                                                                    B2:::::::
2034 010312                                    FOR BANK := #0 TO #167
     010312  005037  002106                                                                        CLR BANK
     010316                                                                                    B3:::::::
2035 010316  004737  042422                      CALL EXBANK
2036 010322                                      IF MKFLAG IS TRUE AND ACFLAG IS TRUE
     010322  005737  002126                                                                        TST MKFLAG
     010326  001410                                                                              BEQ L57
     010330  005737  002124                                                                        TST ACFLAG
     010334  001405                                                                              BEQ L57
2037 010336                                        IF KPFLAG IS FALSE
     010336  005737  002122                                                                        TST KPFLAG
     010342  001001                                                                              BNE L60
2038 010344  104040                                  ERROR     +40     ;MK11 PROTECTION POINTER FAILURE - DID NOT PROTECT BANK
2039 010346                                        END ;OF IF KPFLAG
     010346                                                                                    L60:::::::
2040 010346                                        LEAVE PROTECTIONTEST
     010346  000406                                                                                BR E2
2041 010350                                      END ;OF IF MKFLAG
     010350                                                                                    L57:::::::
2042 010350                                    END ;OF FOR BANK
     010350  005237  002106                                                                        INC BANK
     010354  023727  002106  000167                                                              CMP BANK,#167
     010362  003755                                                                              BLE B3
     010364                                                                                    E3:::::::
2043 010364                                    END PROTECTIONTEST
     010364                                                                                    E2:::::::
```

```
 2046 010364                            SUBTST  <<CHECK SYSTEM SIZE REGISTER>>
                                ;*****************************************************************************
                                ;*SUBTEST        CHECK SYSTEM SIZE REGISTER
                                ;*****************************************************************************
 2047                           ;THIS CHECKS THE SYSTEM SIZE REGISTER TO INSURE IT IS CORRECT
 2048                           ;AND PROGRAMS ANY MK11 BOXES ON LINE THAT ARE NOT INHIBITED.
 2049                           ;
 2050                           ;NOTE: IF THE SYSTEM SIZE REGISTER IS SET TO INDICATE A VERY SMALL
 2051                           ;        MEMORY THE PROGRAM MAY NOT BE ABLE TO FUNCTION.
 2052                           ;      IF THE MK11 BOX STARTING ADDRESS LOGIC MALFUNCTIONS THE PROGRAM
 2053                           ;        WILL EITHOR CRASH BECAUSE OF DUAL ADDRESSING PROBLEMS OR
 2054                           ;        WILL HAVE HOLES IN MEMORY (NON-EXISTANT BANKS).
 2055                           ;
 2056                           ;THE TEST FUNCTIONS AS FOLLOWS
 2057                           ;
 2058                           ;1. THE PROGRAM CHECKS FOR MEMORY ON 16K WORD (BANK) BOUNDRIES
 2059                           ;   THRU THE UNIBUS MAP (SO THAT THE SYSTEM SIZE REGISTER IS BYPASSED).
 2060                           ;   LOCATION 'UNITOP' IS ASSIGNED THE NUMBER OF THE LAST BANK THAT WAS
 2061                           ;   ACCESSABLE VIA THE UNIBUS MAP.
 2062                           ;
 2063                           ;2. LOCATION 'HIBANK' IS SET TO THE HIGHEST BANK THAT IS EITHOR
 2064                           ;   (1) DIRECTLY ACCESSABLE VIA THE MEMORY BUS OR
 2065                           ;   (2) AN MK11 CSR CLAIMS THAT IT EXISTS.
 2066                           ;
 2067                           ;3. LOCATION 'HIACBANK' IS ASSIGNED THE NUMBER OF THE HIGHEST BANK
 2068                           ;   THAT IS DIRECTLY ACCESSABLE VIA THE MEMORY BUS.
 2069                           ;
 2070                           ;4. IF THE HIGHEST ACCESSABLE BANK IS LESS THAN #170
 2071                           ;     IF ANY BOX STARTING ADDRESSES WERE ABOVE BANK #167
 2072                           ;       TRY TO PROGRAM THE STARTING ADDRESS OF THE PENDING BOX
 2073                           ;       IF IT DOES PROGRAM DOWN AND THEREFORE ADD MEMORY TO THE SYSTEM
 2074                           ;         RESTART THE PROGRAM
 2075                           ;     NEXT PENDING BOX
 2076                           ;
 2077                           ;5. R0 IS SET TO THE HIGHEST BANK NUMBER OF HIBANK OR UNITOP
 2078                           ;
 2079                           ;6. IF THE SYSTEM SIZE REGISTER DOES NOT EQUAL R0'S BANK THEN PRINT THE ERROR
```

```
 2082                                          ;FIND UNITOP
 2083 010364  104424                           CACHOFF                    ;TURN CACHE OFF
 2084 010366  005037  170372                   CLR     MAPH36             ;SET MAP TO BANK 1
 2085 010372  012737  100000  170370           MOV     #100000,MAPL36
 2086 010400                                   SET4    #2$                ;TRAPS TO 4 GOTO 2$
      010400  012737  010446  000004           MOV     #2$,4
                                               .DSABL  CRF
 2087 010406  012737  000004  002100           MOV     #4,NOPAR           ;PARITY ACTION = COUNT & IGNORE
 2088 010414  012700  140000                   MOV     #140000,R0         ;PAR6 SELECTED
 2089 010420  005710                    1$:    TST     (R0)               ;TRAP IF NON-EXISTANT
 2090 010422  062737  100000  170370           ADD     #100000,MAPL36     ;BUMP 1 BANK
 2091 010430  005537  170372                   ADC     MAPH36
 2092 010434  022737  000073  170372           CMP     #73,MAPH36         ;INTO 128K SHADOW MEMORY?
 2093 010442  001366                           BNE     1$                 ;NO - LOOP
 2094 010444  000402                           BR      3$
 2095 010446  062706  000004            2$:    ADD     #4,SP              ;FIX STACK FROM TRAP
 2096 010452  162737  100000  170370    3$:    SUB     #100000,MAPL36
 2097 010460  005637  170372                   SBC     MAPH36
 2098 010464                                   RES4                       ;RESET TRAPS TO 4 TO DEFAULT
      010464  012737  036726  000004           MOV     #TIMEOUT,4
      010472  005037  177766                   CLR     CPUERR         ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                       ;THAT A EXPECTED TRAP COULD HAVE SET
                                               .DSABL  CRF
 2099 010476  005037  002100                   CLR     NOPAR              ;RESTORE DEFAULT PARITY ACTION
 2100 010502  006137  170370                   ROL     MAPL36
 2101 010506  006137  170372                   ROL     MAPH36
 2102 010512  013737  170372  002516           MOV     MAPH36,UNITOP
 2103
 2104                                          ;FIND HIBANK
 2105 010520  012737  000077  170372           MOV     #77,MAPH36         ;RESTORE MAP36
 2106 010526  012737  160000  170370           MOV     #160000,MAPL36
 2107 010534  104423                           CACHON                     ;TURN CACHE ON
 2108 010536                                   PUSH    SLAVES
      010536  013746  002730                                                      MOV SLAVES,-(SP)
 2109 010542  012737  000003  002730           MOV     #3,SLAVES          ;FAKE OUT THE EXBANK ROUTINE
 2110 010550                                   BEGIN MEMSIZELOOP
      010550                                                                B4::::::
 2111 010550                                     FOR BANK := #0 TO #167
      010550  005037  002106                                                      CLR BANK
      010554                                                                B5::::::
 2112 010554  004737  042422                       CALL        EXBANK
 2113 010560                                       IF ACFLAG IS FALSE AND MKFLAG IS FALSE
      010560  005737  002124                                                      TST ACFLAG
      010564  001004                                                            BNE L61
      010566  005737  002126                                                      TST MKFLAG
      010572  001001                                                            BNE L61
 2114 010574                                         LEAVE MEMSIZELOOP
      010574  000406                                                            BR E4
 2115 010576                                       END ;OF IF ACFLAG
      010576                                                                L61::::::
 2116 010576                                     END ;OF FOR BANK
      010576  005237  002106                                                      INC BANK
      010602  023727  002106  000167                                            CMP BANK,#167
      010610  003761                                                            BLE B5
      010612                                                                E5:::::::
 2117 010612                                   END MEMSIZELOOP
      010612                                                                E4::::::
```

EQ 006'

```
2118 010612  013700  002106                MOV     BANK,R0
2119 010616  005300                        DEC     R0
2120 010620  010037  002512                MOV     R0,HIBANK
```

```
2123                                    ;FIND HIACBANK
2124 010624                             CLEAR   BANK,HIACBANK
     010624  005037  002106                                                   CLR  BANK
     010630  005037  002514                                                   CLR  HIACBANK
2125 010634                             SET     ACFLAG
     010634  012737  177777  002124                                           MOV  #-1,ACFLAG
2126 010642                             WHILE ACFLAG IS TRUE AND BANK LT #167
     010642                                                             B6:::::::
     010642  005737  002124                                                   TST ACFLAG
     010646  001411                                                           BEQ L62
     010650  023727  002106  000167                                           CMP BANK,#167
     010656  002005                                                           BGE L62
2127 010660  005237  002106               INC   BANK
2128 010664  004737  042422               CALL  EXBANK
2129 010670                             END ;OF WHILE ACFLAG
     010670  000764                                                           BR B6
     010672                                                             L62:::::::
     010672                                                             E6:::::::
2130 010672                             POP     SLAVES                  ;RESTORE FROM FAKE OUT
     010672  012637  002730                                                   MOV (SP)+,SLAVES
2131 010676  013737  002106  002514     MOV     BANK,HIACBANK
2132
2133                                    ;PROGRAM ON ANY BOXES  SETUP FOR ALLOW PROGRAM
2134                                    ;& HI (100) STARTING ADDRESSES
2135 010704                             IF HIACBANK LT #170
     010704  023727  002514  000170                                           CMP HIACBANK,#170
     010712  002071                                                           BGE L63
2136 010714                               IF PENDBOX IS TRUE
     010714  005737  002330                                                   TST PENDBOX
     010720  001466                                                           BEQ L64
2137 010722  013701  002330                 MOV PENDBOX,R1
2138 010726                               FOR CSRNO := #0 TO #34 BY #4
     010726  005037  002256                                                   CLR CSRNO
     010732                                                             B7:::::::
2139 010732  106301                         ASLB    R1
2140 010734                               ON.ERROR
     010734  103051                                                           BCC L65
2141 010736                                 SET     TWOCSRS
     010736  012737  177777  002600                                           MOV  #-1,TWOCSRS
2142 010744  012737  000001  002144         MOV     #1,CSR
2143 010752  013737  002514  002146         MOV     HIACBANK,CSR+2
2144 010760  000241                         CLC
2145 010762  006037  002146                 ROR     CSR+2
2146 010766  005537  002146                 ADC     CSR+2           ;IF NOT 32K WORD BOUND LEAVE A WHOLE IN MEM
2147 010772  052737  002000  002146         BIS     #BIT10,CSR+2    ;LOAD START ADD & INTERLEAVE BIT
2148 011000  104425                         LOADCSR
2149 011002                                 CLEAR   CSR,CSR+2,TWOCSRS
     011002  005037  002144                                                   CLR  CSR
     011006  005037  002146                                                   CLR  CSR+2
     011012  005037  002600                                                   CLR  TWOCSRS
2150 011016  012737  000010  002144         MOV     #BIT3,CSR
2151 011024  104425                         LOADCSR
2152 011026  104426                         READCSR
2153 011030  013702  002146                 MOV     CSR+2,R2
2154 011034  042702  177000                 BIC     #177000,R2
2155 011040  006302                         ASL     R2
2156 011042                                 IF R2 LT #167           ;IF I CHANGED IT'S STARTING ADDRESS
```

```
        011042  020227  000167                                                 CMP R2,#167
        011046  002004                                                         BGE L66
  2157  011050  005037  002670                                                   CLR   LOCK
  2158  011054  000137  004352                                                   JMP   START
  2159  011060                                                               END ;OF IF R2
        011060                                                         L66:;;;;;;
  2160  011060                                                           END ;OF ON.ERROR
        011060                                                         L65:;;;;;;
  2161  011060                                                         END ;OF FOR CSRNO
        011060  062737  000004  002256                                           ADD #4,CSRNO
        011066  023727  002256  000034                                           CMP CSRNO,#34
        011074  003716                                                           BLE B7
        011076                                                         E7:;;;;;;;
  2162  011076                                                       END ;OF IF PENDBOX
        011076                                                         L64:;;;;;;
  2163  011076                                                     END ;OF IF HiACBANK
        011076                                                         L63:;;;;;;
```

```
                                        ;R0 :- MAX(HIBANK,UNITOP)
011076                                  IF R0 LT UNITOP THEN LET R0 := UNITOP
011076  020037  002516                                                  CMP R0,UNITOP
011102  002002                                                         BGE L67
011104  013700  002516                                                  MOV UNITOP,R0
011110                                                          L67:::::::

                                        ;CHECK SYSTEM SIZE REGISTER
011110  072027  000011                  ASH     #9.,R0
011114  052700  000777                  BIS     #777,R0                 ;R0 = LAST GOOD ADDRESS (LESS 6 LSB'S)
011120  020037  177760                  CMP     R0,SIZELO               ;IS IT RIGHT?
011124  001503                          BEQ     SUBAAT
011126  012737  177760  002040          MOV     #SIZELO,ADDRESS
011134  010037  002050                  MOV     R0,GOOD
011140  013737  177760  002056          MOV     SIZELO,BAD
011146  000300                          SWAB    R0
011150  004737  011210                  CALL    SYSSIZE
011154  010137  002476                  MOV     R1,GDSWITCH
011160  013700  177760                  MOV     SIZELO,R0
011164  000300                          SWAB    R0
011166  004737  011210                  CALL    SYSSIZE
011172  010137  002500                  MOV     R1,BDSWITCH
011176  104023                          ERROR   +23
011200  013737  002754  002020          MOV     $ERTTL,LASTERROR        ;DON'T COUNT AS 'DETECTED BUT NOT ISOLATED''
011206  000452                          BR      SUBAAT

                                        ;DETERMINE SWITCH SETTINGS IN R1 FROM ADDRESS IN R0
011210  005001                  SYSSIZE:CLR     R1
011212                                  IF #BIT0 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT2
011212  032700  000001                                                  BIT #BIT0,R0
011216  001402                                                         BEQ L70
011220  052701  000004                                                  BIS #BIT2,R1
011224                                                          L70:::::::
011224                                  IF #BIT1 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT0
011224  032700  000002                                                  BIT #BIT1,R0
011230  001402                                                         BEQ L71
011232  052701  000001                                                  BIS #BIT0,R1
011236                                                          L71:::::::
011236                                  IF #BIT2 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT4
011236  032700  000004                                                  BIT #BIT2,R0
011242  001402                                                         BEQ L72
011244  052701  000020                                                  BIS #BIT4,R1
011250                                                          L72:::::::
011250                                  IF #BIT3 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT7
011250  032700  000010                                                  BIT #BIT3,R0
011254  001402                                                         BEQ L73
011256  052701  000200                                                  BIS #BIT7,R1
011262                                                          L73:::::::
011262                                  IF #BIT4 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT3
011262  032700  000020                                                  BIT #BIT4,R0
011266  001402                                                         BEQ L74
011270  052701  000010                                                  BIS #BIT3,R1
011274                                                          L74:::::::
011274                                  IF #BIT5 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT
011274  032700  000040                                                  BIT #BIT5,R0
011300  001402                                                         BEQ L75
011302  052701  000002                                                  BIS #BIT1,R1
```

```
      011306                                                                L75:;;;;;;
 2196 011306                          IF #BIT6 SET.IN R0 THEN LET R1 := R1 SET.BY #BIT5
      011306  032700  000100                                                    BIT #BIT6,R0
      011312  001402                                                            BEQ L76
      011314  052701  000040                                                    BIS #BIT5,R1
      011320                                                                L76:;;;;;;
 2197 011320                          IF #BIT7 SET..  R0 THEN LET R1 := R1 SET.BY #BIT6
      011320  032700  000200                                                    BIT #BIT7,R0
      011324  001402                                                            BEQ L77
      011326  052701  000100                                                    BIS #BIT6,R1
      011332                                                                L77:;;;;;;
 2198 011332  000207                  RETURN
```

```
                                SUBAAT: SUBTST  <<MOVE LOADERS IF NECESSARY>>
                                ;*********************************************************************
                                ;*SUBTEST        MOVE LOADERS IF NECESSARY
                                ;*********************************************************************
                                        ;THE TOP 16K OF THE PROGRAM (WHICH INCLUDES LOADERS) WILL BE MOVED
                                        ;TO AN MK11 PROTECTED AREA IF IT IS NOW IN MK11 MEMORY.
                                        ;IF IT IS IN CORE IT WILL BE LEFT ALONE.
2205 011334                             IF CPUBIT EQ #MASTER
     011334  023727  002114  000020                                                     CMP CPUBIT,#MASTER
     011342  001103                                                                     BNE L100
2206 011344  042737  100000  003024      BIC   #BIT15,CONFIG+6          ;UNPROTECT OLD LOADER SPACE
2207 011352                             BEGIN FIRSTPROTECT
     011352                                                                         B10:::::::
2208 011352                               FOR BANK := #1 TO #167
     011352  012737  000001  002106                                                     MOV #1,BANK
     011360                                                                         B11:::::::
2209 011360  004737  042422                CALL EXBANK
2210 011364                                IF ACFLAG IS TRUE AND BMFLAG IS FALSE
     011364  005737  002124                                                           TST ACFLAG
     011370  001412                                                                   BEQ L101
     011372  005737  002136                                                           TST BMFLAG
     011376  001007                                                                   BNE L101
2211 011400                                  IF KPFLAG IS TRUE OR MKFLAG IS FALSE
     011400  005737  002122                                                           TST KPFLAG
     011404  001003                                                                   BNE L102
     011406  005737  002126                                                           TST MKFLAG
     011412  001001                                                                   BNE L103
     011414                                                                         L102:::::::
2212 011414                                    LEAVE FIRSTPROTECT
     011414  000413                                                                   BR E10
2213 011416                                  END ;OF IF KPFLAG
     011416                                                                         L103:::::::
2214 011416                                END ;OF IF ACFLAG
     011416                                                                         L101:::::::
2215 011416                               END ;OF FOR BANK
     011416  005237  002106                                                           INC BANK
     011422  023727  002106  00167                                                   CMP BANK,#167
     011430  003753                                                                   BLE B11
     011432                                                                         E11:::::::
2216 011432  012737  000001  002106      MOV #1,BANK
2217 011440  004737  042422                CALL        EXBANK
2218 011444                             END FIRSTPROTECT
     011444                                                                         E10:::::::
2219 011444  013737  002106  002710      MOV   BANK,LOADHOME
2220 011452  013700  002110              MOV   BANK[INDEX,R0
2221 011456  052760  100000  003016      BIS   #BIT15,CONFIG(R0)
2222 011464                             IF LOADHOME NE #1
     011464  023727  002710  000001                                                     CMP LOADHOME,#1
     011472  001417                                                                   BEQ L104
2223 011474  012737  000004  002100        MOV #4,NOPAR                 ;PARITY ACTION = COUNT & IGNORE
2224 011502  013700  002710                MOV LOADHOME,R0              ;DESTINATION BANK
2225 011506  012701  000001                MOV #1,R1                    ;SOURCE BANK
2226 011512  004737  042072                CALL BANKMOV
2227 011516  004737  042370                CALL NEWLOAD                 ;MAP KERNEL TO NEW LOADER BANK
2228 011522  005037  002100                CLR NOPAR
2229 011526  005037  002074                CLR PARCNT
2230 011532                             END ;OF IF LOADHOME
```

```
      011532                                                                    L104:::::::
 2231                                          ;COPY MAPPING FOR ANY SLAVES
 2232 011532  012700  172340                   MOV   #KIPAR0,R0
 2233 011536  012701  002550                   MOV   #KI0,R1
 2234 011542  012705  000010                   MOV   #8.,R5
 2235 011546  012021                    1$:    MOV   (R0)+,(R1)+
 2236 011550  077502                           SOB   R5,1$
 2237 011552                                 END ;OF IF CPUBIT
      011552                                                                    L100:::::::
 2238
 2239 011552                                 ;E*    STOPOK
      011552  012737  177777  002520                                    MOV  #-1,STOPOK
```

```
 2242 011560                            SUBTST  <<MULTIPORT HOOK>>
                                ;*****************************************************************************
                                ;*SUBTEST       MULTIPORT HOOK
                                ;*****************************************************************************
 2243                                   ;THIS IS WHERE WE SEPARATE THE MASTER FROM THE SLAVES.
 2244                                   ;THE MASTER IS THE PROCESSOR RUNNING WITH LOCATION ''CPUBIT''
 2245                                   ;EQUAL TO #MASTER (BIT4).
 2246                                   ;
 2247                                   ;SLAVES ARE STOPPED HERE.
 2248                                   ;IF THERE IS AN IIST AND FIELD SERVICE IS ALLOWING US TO USE IT
 2249                                   ;  THE SLAVE LOWERS HIS PRIORITY AND WAITS FOR AN INTERRUPT
 2250                                   ;  FROM THE MASTER'S IIST.
 2251                                   ;ELSE
 2252                                   ;  THE SLAVE MOVES INTO THE UIPAR'S AND EXECUTES A LITTLE PROGRAM
 2253                                   ;  THAT LOOKS FOR A COUNT PATTERN ''10,9,8,7,6,5,4,3,2,1,0'' IN HIS
 2254                                   ;  PSEUDO TTY BUFFER (PTYBUF+ID).
 2255 011560  104424                   CACHOFF                 ;TURN CACHE OFF
 2256 011562                            IF MULTIPORT IS FALSE THEN JUMPTO SUBAAR
      011562  005737  003014                                                      TST MULTIPORT
      011566  001002                                                            BNE L105
      011570  000137  013160                                                    JMP SUBAAR
      011574                                                                 L105:;;;;;;
 2257 011574                            IF CPUBIT EQ #SLAVE1
      011574  023727  002114  000040                                           CMP CPUBIT,#SLAVE1
      011602  001004                                                          BNE L106
 2258 011604  012700  000002              MOV   #2,R0
 2259 011610  000137  011656              JMP   CPUID
 2260 011614                            END ;OF IF CPUBIT
      011614                                                                 L106:;;;;;;
 2261 011614                            IF CPUBIT EQ #SLAVE2
      011614  023727  002114  000100                                           CMP CPUBIT,#SLAVE2
      011622  001004                                                          BNE L107
 2262 011624  012700  000004              MOV   #4,R0
 2263 011630  000137  011656              JMP   CPUID
 2264 011634                            END ;OF IF CPUBIT
      011634                                                                 L107:;;;;;;
 2265 011634                            IF CPUBIT EQ #SLAVE3
      011634  023727  002114  000200                                           CMP CPUBIT,#SLAVE3
      011642  001004                                                          BNE L110
 2266 011644  012700  000006              MOV   #6,R0
 2267 011650  000137  011656              JMP   CPUID
 2268 011654                            END ;OF IF CPUBIT
      011654                                                                 L110:;;;;;;
 2269 011654  005000                    CLR     R0              ;MUST BE MASTER THEN
 2270
 2271 011656                        CPUID:  IF NOIIST IS TRUE
      011656  005737  002756                                                      TST NOIIST
      011662  001403                                                          BEQ L111
 2272 011664  013702  177764              MOV   SYSTID,R2
 2273 011670                            ELSE
      011670  000411                                                          BR  L112
      011672                                                                 L111:;;;;;;
 2274 011672  012777  100000  171036        MOV   #BIT15,@IISTACR
 2275 011700  017702  171032              MOV   @IISTACR,R2
 2276 011704  072227  177770              ASH   #-8.,R2
 2277 011710  042702  177774              BIC   #^C3,R2
 2278 011714                            END ;OF IF NOIIST
```

```
                011714                                                                  L112:::::::
  2279 011714   010260  002606                  MOV     R2,PORTDIR(R0)
  2280
  2281                                          ;THIS IS WHERE THE SLAVES COME TO STOP
  2282 011720   010003                  STOPCPU:MOV     R0,R3
  2283 011722                                   IF NOIIST IS TRUE
       011722   005737  002756                                                          TST NOIIST
       011726   001417                                                                  BEQ L113
  2284 011730                                     IF R0 EQ #0 THEN GOTO MP1     ;SKIP IF I'M THE MASTER
       011730   005700                                                                  TST R0
       011732   001456                                                                  BEQ MP1
  2285 011734   052760  100000  002616              BIS   #BIT15,TASK(R0)
  2286 011742                                     BMOV  WAITSTUFF
       011742   004537  043710                       JSR R5,BLOCK1
       011746   012034                             WAITSTUFF
                                                   .DSABL      CRF
  2287 011750   005337  002670                    DEC   LOCK                    ;ALLOW OTHERS TO RUN
  2288 011754   062700  002636                    ADD   #PTYBUF,R0              ;R0 POINTS TO COUNT DOWN LOCATION
  2289
  2290                                                                          ;WAIT FOR MASTER TO COUNT DOWN!
  2291 011760   000137  177640                    JMP   FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
  2292 011764                                   ELSE
       011764   000423                                                                  BR L114
       011766                                                                  L113:::::::
  2293 011766   004737  061074                    CALL  IISTINIT
  2294 011772                                     IF R0 EQ #0 THEN GOTO MP1     ;SKIP IF I'M THE MASTER
       011772   005700                                                                  TST R0
       011774   001435                                                                  BEQ MP1
  2295 011776   012777  000001  170732              MOV   #1,@IISTACR
  2296 012004   012777  000004  170726              MOV   #BIT2,@IISTADR          ;ENABLE INTERRUPTS
  2297 012012   000234                             SPL   4
  2298 012014   052760  100000  002616              BIS   #BIT15,TASK(R0)
  2299 012022   005337  002670                    DEC   LOCK                    ;ALLOW OTHERS TO RUN
  2300 012026   000001                           WAIT                           ;WAIT IF I'M A SLAVE
  2301 012030   000137  050726                    JMP   TASKDO
  2302 012034                                   END ;OF IF NOIIST
       012034                                                                  L114:::::::
```

```
2305 012034                          WAITSTUFF:SUBTST        <<SLAVES WAIT FOR MASTER TO COUNT DOWN>>
                                     ;*********************************************************************
                                     ;*SUBTEST        SLAVES WAIT FOR MASTER TO COUNT DOWN
                                     ;*********************************************************************
2306 012034  012702  000014         1$:     MOV     #12.,R2         ;V177640
2307 012040  012701  000013                 MOV     #11.,R1         ;V177644
2308 012044  005302                 2$:     DEC     R2              ;V177650
2309 012046  005301                         DEC     R1              ;V177652
2310 012050  020210                 3$:     CMP     R2,(R0)         ;V177654
2311 012052  001776                         BEQ     3$              ;V177656
2312 012054  020110                         CMP     R1,(R0)         ;V177660
2313 012056  001366                         BNE     1$              ;V177662
2314 012060  005701                 4$:     TST     R1              ;V177664
2315 012062  001370                         BNE     2$              ;V177666
2316 012064  000137  061216                 JMP     SLAVUP          ;V177670
```

```
 2319 012070                    MP1:    SUBTST  <<BOOT UP ALL EXISTING CPU'S>>
                                ;*********************************************************************
                                ;*SUBTEST       BOOT UP ALL EXISTING CPU'S
                                ;*********************************************************************
 2320                                   ;ALL SLAVES ARE BOOTED AS FOLLOWS
 2321                                   ;
 2322                                   ;SETUP A SOFTWARE SWITCH REGISTER.
 2323                                   ;IF WE ARE USING IIST'S.
 2324                                   ;  BEGIN BOOTLOOP
 2325                                   ;    FOR EACH OF 4 POSSIBLE CPU'S.
 2326                                   ;      SETUP STACK VALUE LESS THAN PREVIOUS CPU.
 2327                                   ;      CLEAR ACKNOWLEDGE.
 2328                                   ;      POINT IIST INTERRUPT VECTOR TO START.
 2329                                   ;MP2:  WAIT FOR THE MASTER'S IIST TO BE READY (SHOULD ALREADY BE).
 2330                                   ;      INITIALIZE THE MASTER'S IIST (DISABLE BOOTS & INTERRUPTS).
 2331                                   ;      INITIATE THE IIST BOOT OF THE SELECTED CPU.
 2332                                   ;      WAIT FOR THE WINDOW IN THE BOOT THAT ALLOWS INTERRUPTS.
 2333                                   ;      INITIATE THE IIST INTERRUPT OF THE SELECTED CPU.
 2334                                   ;      WAIT FOR THE SLAVE TO ACKNOWLEDGE STARTING.
 2335                                   ;      IF THE CPU DOES NOT ACKNOWLEDGE
 2336                                   ;        IF THE CPU SELECTED IS NOT THE MASTER
 2337                                   ;          LEAVE BOOTLOOP.
 2338                                   ;        ELSE
 2339                                   ;          GOTO MP2.
 2340                                   ;        END OF IF THE CPU SELECTED IS NOT THE MASTER.
 2341                                   ;      ELSE
 2342                                   ;        WAIT FOR TASK DONE FROM SLAVE (TASK=START).
 2343                                   ;        UPDATE SLAVE COUNT (THIS SLAVE IS THE HIGHEST # SO FAR).
 2344                                   ;        IF THIS WAS THE 4TH CPU THEN LEAVE BOOTLOOP.
 2345                                   ;      END OF IF THE CPU DOES NOT ACKNOWLEDGE.
 2346                                   ;    END OF FOR EACH OF 4 POSSIBLE CPU'S.
 2347                                   ;  END OF BOOTLOOP.
 2348                                   ;  IF THERE WERE NO SLAVES
 2349                                   ;    CLEAR THE MULTIPROCESSING FLAG 'MULTIPORT'.
 2350                                   ;    SET THE IIST VECTOR TO LOOK FOR UNEXPECTED TRAPS.
 2351                                   ;  END OF IF THERE WERE NO SLAVES.
 2352                                   ;ELSE
 2353                                   ;  FOR EACH SLAVE
 2354                                   ;    SETUP STACK VALUE LESS THAN PREVIOUS CPU.
 2355                                   ;    TYPE 'START SLAVE #N AT ADDRESS 200'.
 2356                                   ;    WAIT FOR TASK DONE FROM SLAVE (TASK=START).
 2357                                   ;  END OF FOR EACH SLAVE.
 2358                                   ;END OF IF WE ARE USING IIST'S.
 2359                                   ;RESTORE THE MASTER TO THE NORMAL SWITCH REGISTER
 2360                                   ;WAIT A SECOND.
 2361                                   ;MAKE SURE I'M THE ONLY PROCESSOR RUNNING.
 2362                                   ;SETUP STACK VALUE BACK TO MASTER'S DEFAULT.
 2363                                   ;TURN CACHE ON.
```

```
2366
2367                                                .ENABL  LSB
2368 012070  005337  002670                        DEC     LOCK                    ;ALLOW ONE SLAVE TO RUN
2369                                                ;PASS PSEUDO SWR TO SLAVE
2370 012074  013737  002766  002674                MOV     SWR,MASWR               ;SAVE REAL SWR
2371 012102  012737  000176  002766                MOV     #SWREG,SWR              ;SETUP SOFTWARE SWR
2372 012110  017777  170560  170650                MOV     @MASWR,@SWR             ;FILL IT WITH REAL SWR STUFF
2373 012116                                        IF NOIIST IS TRUE THEN JUMPTO MP4
     012116  005737  002756                                                        TST NOIIST
     012122  001402                                                              BEQ L115
     012124  000137  012552                                                      JMP MP4
     012130                                                                  L115:;;;;;;;
2374 012130  012702  000400                        MOV     #BIT8,R2                ;BOOT = BITS 11,10,9,8
2375 012134  012703  000001                        MOV     #1,R3                   ;INTERRUPT = BITS 3,2,1,0
2376 012140                                        BEGIN BOOTLOOP
     012140                                                                  B12:;;;;;;;
2377 012140                                        FOR R1 := #1 TO #3
     012140  012701  000001                                                      MOV #1,R1
     012144                                                                  B13:;;;;;;;
2378 012144  162737  000200  002706                  SUB   #200,KSTACK             ;SLAVES - PLEASE USE YOUR OWN STACK
2379 012152  013737  002706  000000                  MOV   KSTACK,0                ;PUT IN LOC 0 FOR BOOTSTRAP
2380 012160  012700  000020                        MOV     #MASTER,R0              ;SET FIRST CPU ID BIT
2381 012164  072001                                ASH     R1,R0                   ;SHIFT IT TO CORRECT SPOT
2382 012166  010037  002114                        MOV     R0,CPUBIT               ;CPUBIT = BIT5 OR BIT6 OR BIT7
2383 012172  010100                                MOV     R1,R0                   ;CPU # ---> R0
2384 012174  006300                                ASL     R0                      ;R0 := 2 OR 4 OR 6 ;INDEX VALUE
2385 012176  005037  002672                        CLR     ACK                     ;ALLOW ONLY ONE CPU AT A TIME
2386 012202  013704  002742                        MOV     IISTVEC,R4
2387 012206  012724  004352                        MOV     #START,(R4)+            ;INTERRUPT VECTOR TO START
2388 012212  012714  000340                        MOV     #340,(R4)               ;HIGH PRIORITY
2389
2390                                               ;WAIT FOR IIST READY
2391 012216  012737  061165  002574                MOV     #5*SECONDS,HUNGTIME
2392 012224  012777  000001  170504  MP2:          MOV     #1,@IISTACR
2393 012232  004737  072154                        CALL    QUE
2394 012236                                        ON.ERROR
     012236  103004                                                              BCC L116
2395 012240  104061                                  ERROR       +61            ;IIST IS HANGING SYSTEM!
2396 012242  005037  002730                          CLR SLAVES
2397 012246                                          LEAVE       BOOTLOOP
     012246  000530                                                              BR E12
2398 012250                                        END ;OF ON.ERROR
     012250                                                                  L116:;;;;;;;
2399 012250  032777  004000  170462                BIT     #BIT11,@IISTADR
2400 012256  001762                                BEQ     MP2
2401
2402 012260  004737  061174                        CALL    IISTOFF                 ;INITIALIZE THE IIST & DISABLE BOOTS & INTERRUPTS
2403 012264  012777  000000  170444                MOV     #0,@IISTACR             ;SELECT THE ACCESS CONTROL REGISTER
2404 012272  010277  170442                        MOV     R2,@IISTADR             ;BOOT SOME CPU
2405 012276  012777  000001  170434                MOV     #1,@IISTADR             ;NOW!
2406                                               ;THIS DELAY IS GOOD ONLY FOR THE M9312 MULTIPROCESSOR BOOT
2407                                               ;THIS DELAY ALSO ASSUMES THAT CACHE IS OFF
2408 012304  012704  140000                        MOV     #140000,R4      ;THIS DELAY TAKES APPROX 3/4 SECOND
2409 012310  000240                        3$:     NOP
2410 012312  000240                                NOP
2411 012314  000240                                NOP
2412 012316  000240                                NOP
```

```
 2413 012320  005237  000110                    INC   110           ;CHANGE MOVING LOCATION - SEE BOOT LISTING
 2414                                                                ;THIS STOPS THE BOOT FROM RUNNING THE MEMORY
 2415                                                                ;DIAGNOSTIC AND BLOWING UP MY SOFTWARE!
 2416 012324  077407                            SOB   R4,3$
```

```
 2418 012326  012777  000000  170402          MOV   #0,@IISTACR             ;SELECT THE ACCESS CONTROL REGISTER
 2419 012334  010377  170400                  MOV   R3,@IISTADR             ;INTERRUPT SOME CPU
 2420 012340  012777  000001  170372          MOV   #1,@IISTADR             ;NOW!
 2421                                         ;WAIT FOR ACK OR TIMEOUT
 2422 012346  012705  000003                  MOV   #3,R5           ;THIS IS APPROX A 3 SECOND DELAY
 2423 012352  005004                          CLR   R4
 2424 012354                          1$:     IF ACK IS FALSE
      012354  005737  002672                                                      TST ACK
      012360  001004                                                              BNE L117
 2425 012362  005237  000110                    INC 110             ;CHANGE MOVING LOCATION - SEE BOOT LISTING
 2426                                           ;THIS STOPS THE BOOT FROM RUNNING THE MEMORY
 2427                                           ;DIAGNOSTIC AND BLOWING UP MY SOFTWARE.
 2428 012366  077406                            SOB    R4,1$
 2429 012370  077507                            SOB    R5,1$
 2430 012372                                  END ;OF IF ACK IS FALSE
      012372                                                          L117:;;;;;;
 2431 012372                                  IF ACK IS FALSE                ;IF THERE IS NO SLAVE AT THIS IISTID #
      012372  005737  002672                                                      TST ACK
      012376  001011                                                              BNE L120
 2432 012400  006302                            ASL R2
 2433 012402  006303                            ASL R3
 2434 012404                                    IF R3 EQ #BIT4
      012404  020327  000020                                                      CMP R3,#BIT4
      012410  001002                                                              BNE L121
 2435 012412                                      LEAVE BOOTLOOP
      012412  000446                                                              BR E12
 2436 012414                                    ELSE
      012414  000401                                                              BR L122
      012416                                                          L121:;;;;;;
 2437 012416                                      GOTO MP2
      012416  000702                                                              BR MP2
 2438 012420                                    END ;OF IF R3
      012420                                                          L122:;;;;;;
 2439 012420                                  ELSE
      012420  000435                                                              BR L123
      012422                                                          L120:;;;;;;
 2440 012422  005037  002672                    CLR   ACK                      ;ALLOW SLAVE TO PROCEED
 2441 012426  012737  000005  002572            MOV #5,HUNGMSB
 2442 012434  012737  177777  002574            MOV #-1,HUNGTIME
 2443 012442  004737  072154          2$:       CALL        QUE
 2444 012446                                    ON.ERROR
      012446  103012                                                              BCC L124
 2445 012450  162737  000001  002572              SUB       #1,HUNGMSB
 2446 012456                                      ON.ERROR
      012456  103006                                                              BCC L125
 2447 012460  010137  002056                        MOV     R1,BAD
 2448 012464  104060                              ERROR     +60                ;SLAVE IS HANGING SYSTEM!
 2449 012466  005037  002730                        CLR     SLAVES
 2450 012472                                      LEAVE BOOTLOOP
      012472  000416                                                              BR E12
 2451 012474                                    END ;OF ON.ERROR
      012474                                                          L125:;;;;;;
 2452 012474                                  END ;OF ON.ERROR
      012474                                                          L124:;;;;;;
 2453 012474  005760  002616                  TST TASK(R0)
 2454 012500  100360                          BPL 2$
 2455 012502  010137  002730                  MOV R1,SLAVES         ;COUNT OF SLAVES WAS IN R1
```

```
2456 012506                                    IF R3 EQ #BIT3 THEN LEAVE BOOTLOOP
     012506 020327 000010                                                        CMP R3,#BIT3
     012512 001406                                                               BEQ E12
2457 012514                                  END ;OF IF ACK
     012514                                                                  L123:;;;;;;
2458 012514 006302                           ASL   R2
2459 012516 006303                           ASL   R3
2460 012520                                END ;OF FOR R1
     012520 005201                                                               INC R1
     012522 020127 000003                                                        CMP R1,#3
     012526 003606                                                               BLE B13
     012530                                                                  E13:;;;;;;;
2461 012530                                END BOOTLOOP
     012530                                                                  E12:;;;;;;
2462 012530                                IF SLAVES EQ #0
     012530 005737 002730                                                        TST SLAVES
     012534 001005                                                               BNE L126
2463 012536 005037 003014                    CLR   MULTIPORT
2464 012542 012777 036764 170172             MOV   #IITRAP,@IISTVEC      ;RESTORE UNEXPECTED IIST TRAP
2465 012550                                END ;OF IF SLAVES
     012550                                                                  L126:;;;;;;
2466 012550 000462                         BR      MP3
2467 012552                          MP4:  FOR R1 := #1 TO SLAVES
     012552 012701 000001                                                        MOV #1,R1
     012556                                                                  B14:;;;;;;
2468 012556 012700 000020                    MOV   #BIT4,R0
2469 012562 072001                           ASH   R1,R0
2470 012564 010037 002114                    MOV   R0,CPUBIT             ;CPUBIT = BIT5 OR BIT6 OR BIT7
2471 012570 162737 000200 002706             SUB   #200,KSTACK
2472 012576 010100                           MOV   R1,R0
2473 012600 006300                           ASL   R0                    ;R0 = 2 OR 4 OR 6
2474 012602                                  TYPE  MSG081                ;START SLAVE #
     012602 104401 115560                  TYPEIT  ,MSG081
                                           .DSABL  CRF
2475 012606                                  TYPOCS      R1,,1
     012606 010146                         MOV     R1,-(SP)          ;;SAVE R1 FOR TYPEOUT
     012610 104403                         TYPOS                     ;;GO TYPE--OCTAL ASCII
     012612    001                         .BYTE   1                 ;;TYPE 1 DIGIT(S)
     012613    000                         .BYTE   0                 ;;SUPPRESS LEADING ZEROS
                                           .DSABL  CRF
2476 012614                                  TYPE  MSG082                ;AT ADDRESS 200
     012614 104401 115577                  TYPEIT  ,MSG082
                                           .DSABL  CRF
2477 012620 012737 000031 002572             MOV   #25.,HUNGMSB
2478 012626 012737 177777 002574             MOV   #-1,HUNGTIME
2479 012634 005037 002672              5$:   CLR   ACK                   ;ALLOW SLAVE TO PROCEED
2480 012640 004737 072154                    CALL  QUE
2481 012644                                  ON.ERROR
     012644 103015                                                               BCC L127
2482 012646 162737 000001 002572               SUB #1,HUNGMSB
2483 012654                                    ON.ERROR
     012654 103011                                                               BCC L130
2484 012656 010137 002056                      MOV       R1,BAD
2485 012662 104060                             ERROR     +60             ;SLAVE IS HANGING SYSTEM!
2486 012664                                    CLEAR     SLAVES,MULTIPORT
     012664 005037 002730                                                        CLR  SLAVES
     012670 005037 003014                                                        CLR  MULTIPOR
```

```
 2487 012674  000137  012716                        JMP       MP3
 2488 012700                                     END ;OF ON.ERROR
      012700                                                                  L130:;;;;;;
 2489 012700                                   END ;OF ON.ERROR
      012700                                                                  L127:;;;;;;
 2490 012700  005760  002616                     TST   TASK(R0)
 2491 012704  100353                             BPL   5$
 2492 012706                                   END ;OF FOR R1
      012706  005201                                                                 INC R1
      012710  020137  002730                                                         CMP R1,SLAVES
      012714  003720                                                                BLE B14
      012716                                                                  E14:;;;;;;;;
 2493                                          ;POINT THE MASTER BACK TO THE NORMAL SWR
 2494 012716  013737  002674  002766  MP3:     MOV     MASWR,SWR
 2495 012724  012737  000020  002114          MOV     #MASTER,CPUBIT
 2496 012732  052737  000020  002510          BIS     #MASTER,ALLCPUS
 2497                                          ;WAIT A SECOND
 2498 012740  005000                           CLR     R0
 2499 012742  077001                  4$:      SOB     R0,4$
 2500                                          ;STOP ANY CONFUSED MASTER (ME)
 2501 012744  005237  002670                   INC     LOCK
 2502 012750                                   IF LOCK NE #1
      012750  023727  002670  000001                                                 CMP LOCK,#1
      012756  001402                                                                BEQ L131
 2503 012760  000000                  MHALT3:    HALT
 2504 012762  000776                           BR     MHALT3
 2505 012764                                   END ;OF IF LOCK
      012764                                                                  L131:;;;;;;
 2506 012764  012737  000020  002114  MP5:     MOV     #MASTER,CPUBIT          ;BACK TO MASTER
 2507 012772  012737  002000  002706          MOV     #STACK,KSTACK
 2508 013000  104423                           CACHON                  ;TURN CACHE ON
 2509                                          .DSABL  LSB
```

```
                                        SUBTST  <<CHECK FOR UNIQUE CPU ID NUMBERS>>
                                ;*************************************************************************
                                ;*SUBTEST        CHECK FOR UNIQUE CPU ID NUMBERS
                                ;*************************************************************************
                                        CACHOFF                 ;TURN CACHE OFF
                                        BEGIN SAMESAME
                                                                                        B15:::::::
                                        MOV     SLAVES,R2
                                        ASL     R2
                                        FOR R0 := #0 TO R2 BY #2
                                                                                                CLR R0
                                                                                        B16:::::::
                                          FOR R1 := #0 TO R2 BY #2
                                                                                                CLR R1
                                                                                        B17:::::::
                                            IF R0 NE R1
                                                                                                CMP R0,R1
                                                                                                BEQ L132
                                              IF PORTDIR(R0) EQ PORTDIR(R1)
                                                                                                CMP PORTDIR(R0),PORTDIR(R1)
                                                                                                BNE L133
                                                ERROR   +41
                                                TYPE    MSG084          ;PROCEEDING AS A SINGLE PORT TEST
                                        TYPEIT  ,MSG084
                                        .DSABL  CRF
                                                LEAVE SAMESAME
                                                                                                BR E15
                                                CLR     MULTIPORT
                                              END ;OF IF PORTDIR(R0)
                                                                                        L133:::::::
                                            END ;OF IF R0
                                                                                        L132:::::::
                                          END ;OF FOR R1
                                                                                                ADD #2,R1
                                                                                                CMP R1,R2
                                                                                                BLE B17
                                                                                        E17:::::::
                                        END ;OF FOR R0
                                                                                                ADD #2,R0
                                                                                                CMP R0,R2
                                                                                                BLE B16
                                                                                        E16:::::::
                                        END SAMESAME
                                                                                        E15:::::::
                                        CACHON                  ;TURN CACHE ON

                                        SUBTST  <<PRINT MULTIPORT DIRECTORY>>
                                ;*************************************************************************
                                ;*SUBTEST        PRINT MULTIPORT DIRECTORY
                                ;*************************************************************************
                                        IF MULTIPORT IS TRUE
                                                                                                TST MULTIPORT
                                                                                                BEQ L134
                                          TYPE  MSG086
                                        TYPEIT  ,MSG086
                                        .DSABL  CRF
                                          TYPOCS        PORTDIR
```

```
        013102  013746  002606                  MOV     PORTDIR,-(SP)   ;;SAVE PORTDIR FOR TYPEOUT
        013106  104403                           TYPOS                   ;;GO TYPE--OCTAL ASCII
        013110     006                           .BYTE   6               ;;TYPE 6 DIGITS
        013111     000                           .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                 .DSABL  CRF
  2536  013112  112737  000060  115753             MOVB  #'0,MSGA87
  2537  013120                                     FOR R0 := #1 TO SLAVES
        013120  012700  000001                                                          MOV #1,R0
        013124                                                                  B20:::::::
  2538  013124  010001                               MOV R0,R1
  2539  013126  006301                               ASL R1
  2540  013130  105237  115753                       INCB        MSGA87
  2541  013134                                      TYPE        MSG087
        013134  104401  115745                  TYPEIT  ,MSG087
                                                 .DSABL  CRF
  2542  013140                                       TYPOCS      PORTDIR(R1)
        013140  016146  002606                  MOV     PORTDIR(R1),-(SP)       ;;SAVE PORTDIR(R1) FOR TYPEOUT
        013144  104403                           TYPOS                   ;;GO TYPE--OCTAL ASCII
        013146     006                           .BYTE   6               ;;TYPE 6 DIGITS
        013147     000                           .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                 .DSABL  CRF
  2543  013150                                     END ;OF FOR R0
        013150  005200                                                                  INC R0
        013152  020037  002730                                                          CMP R0,SLAVES
        013156  003762                                                                  BLE B20
        013160                                                                  E20:::::::
  2544  013160                                 END ;OF IF MULTIPORT                    L134:::::::
        013160
  2545
  2546  013160                         SUBAAR: SUBTST  <<LOAD CSR'S FROM E-TABLE $CDW1 & $CDW2>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       LOAD CSR'S FROM E-TABLE $CDW1 & $CDW2
                                       ;*****************************************************************************
  2547  013160                               IF $CDW1 NE #0 OR $CDW2 NE #0
        013160  005737  075214                                                          TST $CDW1
        013164  001003                                                                  BNE L135
        013166  005737  075216                                                          TST $CDW2
        013172  001430                                                                  BEQ L136
        013174                                                                  L135:::::::
  2548  013174  013701  002334                 MOV   MKCSRS,R1
  2549  013200  013737  075214  002144         MOV   $CDW1,CSR
  2550  013206  013737  075216  002146         MOV   $CDW2,CSR+2
  2551  013214                                 FOR CSRNO := #0 TO #34 BY #2
        013214  005037  002256                                                          CLR CSRNO
        013220                                                                  B21:::::::
  2552  013220  106301                          ASLB        R1
  2553  013222                                 ON.ERROR
        013222  103001                                                                  BCC L137
  2554  013224  104425                          LOADCSR
  2555  013226                                 END ;OF ON.ERROR
        013226                                                                  L137:::::::
  2556  013226                                 END ;OF FOR CSRNO
        013226  062737  000002  002256                                                  ADD #2,CSRNO
        013234  023727  002256  000034                                                  CMP CSRNO,#34
        013242  003766                                                                  BLE B21
        013244                                                                  E21:::::::
  2557  013244  005237  075142                 INC   $PASS
```

LOAD CSR'S FROM E-TABLE $CDW1 & $CDW2

```
 2558 013250  000137  015050                    JMP    APTHANG          ;GO LOOP FOREVER KEEPING APT ALIVE
 2559 013254                                  END ;OF IF $CDW1
      013254                                                                L136:;;;;;;
```

```
2562 013254                             SUBTST  <<LEGAL CONFIGURATION CHECK>>
                                ;*****************************************************************************
                                ;*SUBTEST       LEGAL CONFIGURATION CHECK
                                ;*****************************************************************************
2563 013254                             IF CPUBIT EQ #MASTER
     013254  023727  002114  000020                                                  CMP CPUBIT,#MASTER
     013262  001156                                                                  BNE L140
2564 013264                               FOR BANK :  #0 TO #167
     013264  005037  002106                                                        CLR BANK
     013270                                                                  B22:::::::
2565 013270  004737  042422                 CALL        EXBANK
2566 013274  013700  002110                 MOV BANKINDEX,R0
2567
2568                                        ;MAKE SURE THAT EVERYBODY CAN ACCESS EVERY BANK
2569 013300                                 IF MKFLAG IS TRUE
     013300  005737  002126                                                        TST MKFLAG
     013304  001472                                                                BEQ L141
2570                                          ;IF ANYBODY CAN ACCESS
2571 013306                                   IF #MASTER!SLAVE1!SLAVE2!SLAVE3 SET.IN CONFIG(R0)
     013306  032760  000360  003016                                                BIT #MASTER!SLAVE1!SLAVE2!SL
     013314  001466                                                                BEQ L142
2572 013316  013737  002510  002114             MOV     ALLCPUS,CPUBIT
2573 013324  004737  042422                     CALL    EXBANK
2574 013330  012737  000020  002114             MOV     #MASTER,CPUBIT
2575                                            ;IF EVERYBODY CAN'T ACCESS
2576 013336                                     IF ACFLAG IS FALSE AND CONFGERROR IS FALSE
     013336  005737  002124                                                        TST ACFLAG
     013342  001053                                                                BNE L143
     013344  005737  002576                                                        TST CONFGERROR
     013350  001050                                                                BNE L143
2577 013352                                       SET CONFGERROR
     013352  012737  177777  002576                                                MOV  #-1,CONFGERROR
2578 013360                                       CLEAR SLFLAG,SLFLAG+2,SLFLAG+4,SLFLAG+6
     013360  005037  002656                                                        CLR  SLFLAG
     013364  005037  002660                                                        CLR  SLFLAG+2
     013370  005037  002662                                                        CLR  SLFLAG+4
     013374  005037  002664                                                        CLR  SLFLAG+6
2579 013400                                       IF #MASTER SET.IN CONFIG(R0) THEN LET SLFLAG := ONES
     013400  032760  000020  003016                                                BIT #MASTER,CONFIG(R0)
     013406  001403                                                                BEQ L144
     013410  013737  002726  002656                                                MOV ONES,SLFLAG
     013416                                                                  L144:::::::
2580 013416                                       IF #SLAVE1 SET.IN CONFIG(R0) THEN LET SLFLAG+2 := ONES
     013416  032760  000040  003016                                                BIT #SLAVE1,CONFIG(R0)
     013424  001403                                                                BEQ L145
     013426  013737  002726  002660                                                MOV ONES,SLFLAG+2
     013434                                                                  L145:::::::
2581 013434                                       IF #SLAVE2 SET.IN CONFIG(R0) THEN LET SLFLAG+4 := ONES
     013434  032760  000100  003016                                                BIT #SLAVE2,CONFIG(R0)
     013442  001403                                                                BEQ L146
     013444  013737  002726  002662                                                MOV ONES,SLFLAG+4
     013452                                                                  L146:::::::
2582 013452                                       IF #SLAVE3 SET.IN CONFIG(R0) THEN LET SLFLAG+6 := ONES
     013452  032760  000200  003016                                                BIT #SLAVE3,CONFIG(R0
     013460  001403                                                                BEQ L147
     013462  013737  002726  002664                                                MOV ONES,SLFLAG+6
     013470                                                                  L147:::::::
```

```
2583 013470  104063                                    ERROR +63
2584 013472                                          END ;OF IF ACFLAG
     013472                                                                    L143:;;;;;;
2585 013472                                        END ;OF IF #MASTER.SLAVE1.SLAVE2!SLAVE3
     013472                                                                    L142:;;;;;;
2586 013472                                      END ;OF IF MKFLAG IS TRUE
     013472                                                                    L141:;;;;;;
2587
2588                                             ;MAKE SURE (IF I CAN) THAT EACH BOX HAS ONE & ONLY ONE CSR
2589 013472  004737  042422                      CALL       FXBANK
2590 013476                                      IF ACFLAG IS TRUE AND MKFLAG IS TRUE
     013476  005737  002124                                                    TST ACFLAG
     013502  001440                                                           BEQ L150
     013504  005737  002126                                                    TST MKFLAG
     013510  001435                                                           BEQ L150
2591 013512  016001  003016                        MOV        CONFIG(R0),R1
2592 013516  042701  177770                        BIC        #^C7,R1              ;R1   0 OR 1 OR 2 OR 4
2593 013522                                        IF #BIT12 OFF.IN CONFIG+2(R0)    ;IF NO INTERNAL INTERLEAVE
     013522  032760  010000  003020                                               BIT #BIT12,CONFIG+2(R0)
     013530  001001                                                           BNE L151
2594 013532  006301                                  ASL      R1                 ;R1 - 0 OR 2 OR 4
2595 013534                                        END ;OF IF #BIT3
     013534                                                                    L151:;;;;;;
2596 013534                                        IF R1 EQ #0 THEN LEi R1 := R1 + #1
     013534  005701                                                           TST R1
     013536  001001                                                           BNE L152
     013540  005201                                                           INC R1
     013542                                                                    L152:;;;;;;
2597                                               ;NOW
2598                                               ;INTERLEAVE                R1              INTERLEAVE FACTOR
2599                                               ;----------                --              -----------------
2600                                               ;4 TO 1 EXT & INTERNAL      4                      8
2601                                               ;4 TO 1 EXT & NO INT        4                      4
2602                                               ;2 TO 1 EXT & INTERNAL      2                      4
2603                                               ;2 TO 1 EXT & NO INT        2                      2
2604                                               ;   NO EXT & INTERNAL      1                      2
2605                                               ;   NO EXT & NO INT        1                      0
2606                                               ;
2607                                               ;SO
2608                                               ;R1 = 1 OR 2 OR 4 = "# OF CSR'S ON THIS BANK"
2609 013542  005004                                CLR        R4
2610 013544  116002  003022                        MOVB       CONFIG+4(R0),R2
2611 013550  012703  000010                        MOV        #8.,R3
2612 013554  006002                      1$:       ROR        R2                    ;COUNT CSR'S IN THIS BANK
2613 013556  005504                                ADC        R4
2614 013560  077303                                SOB        R3,1$
2615
2616                                               ;IF # OF CSR'S IS WRONG!
2617 013562                                        IF R4 NE R1 AND CONFGERROR IS FALSE
     013562  020401                                                           CMP R4,R1
     013564  001407                                                           BEQ L153
     013566  005737  002576                                                    TST CONFGERROR
     013572  001004                                                           BNE L153
2618 013574                                          SET      CONFGERROR
     013574  012737  177777  002576                                           MOV  #-1,CONFGERROR
2619 013602  104064                                  ERROR    +64
2620 013604                                        END ;OF IF R4
```

```
      013604                                                                    L153:;;;;;;
 2621 013604                                  END ;OF IF ACFLAG
      013604                                                                    L150:;;;;;;
 2622 013604                                END ;OF FOR BANK
      013604  005237  002106                                                          INC BANK
      013610  023727  002106  000167                                                  CMP BANK,#167
      013616  003624                                                                 BLE B22
      013620                                                                    E22:;;;;;;;
 2623 013620                              END ;OF IF CPUBIT
      013620                                                                    L140:;;;;;;
```

```
 2626 013620                            SUBTST  <<PRINT CONFIGURATION DETAILS>>
                                ;*****************************************************************************
                                ;*SUBTEST       PRINT CONFIGURATION DETAILS
                                ;*****************************************************************************
 2627 013620  005037  002466            CLR     MJSIZE
 2628 013624  005037  002470            CLR     MKSIZE
 2629 013630                            FOR R1 := #0 TO #167*3*2 BY #6
      013630  005001                                                                    CLR R1
      013632                                                                B23:::::::
 2630 013632                              IF CPUBIT SET.IN CONFIG(R1)
      013632  033761  002114  003016                                                    BIT CPUBIT,CONFIG(R1)
      013640  001420                                                                   BEQ L154
 2631 013642                                IF #BIT14.BIT13 OFF.IN CONFIG(R1) THEN LET MJSIZE := MJSIZE + #1
      013642  032761  060000  003016                                                   BIT #BIT14!BIT13,CONFIG(R1)
      013650  001002                                                                   BNE L155
      013652  005237  002466                                                         INC MJSIZE
      013656                                                                L155:::::::
 2632 013656                                IF #BIT14 OFF.IN CONFIG(R1) AND #BIT13 SET.IN CONFIG(R1)
      013656  032761  040000  003016                                                   BIT #BIT14,CONFIG(R1)
      013664  001006                                                                   BNE L156
      013666  032761  020000  003016                                                   BIT #BIT13,CONFIG(R1)
      013674  001402                                                                   BEQ L156
 2633 013676                                  LET MKSIZE := MKSIZE + #1
      013676  005237  002470                                                         INC MKSIZE
 2634 013702                                END ;OF IF MK11 MEMORY
      013702                                                                L156:::::::
 2635 013702                              END ;OF IF ACCESSABLE BY CPU
      013702                                                                L154:::::::
 2636 013702                            END ;OF FOR ALL BANKS IN TABLE
      013702  062701  000006                                                         ADD #6,R1
      013706  020127  001312                                                         CMP R1,#167*3*2
      013712  003747                                                                 BLE B23
      013714                                                                E23:::::::::
 2637 013714  006337  002466            ASL     MJSIZE
 2638 013720  006337  002466            ASL     MJSIZE
 2639 013724  006337  002466            ASL     MJSIZE
 2640 013730  006337  002466            ASL     MJSIZE                  ;MJSIZE := MJSIZE * 16.
 2641 013734  006337  002470            ASL     MKSIZE
 2642 013740  006337  002470            ASL     MKSIZE
 2643 013744  006337  002470            ASL     MKSIZE
 2644 013750  006337  002470            ASL     MKSIZE                  ;MKSIZE := MKSIZE * 16.
 2645 013754  005237  002516            INC     UNITOP
 2646 013760  006337  002516            ASL     UNITOP
 2647 013764  006337  002516            ASL     UNITOP
 2648 013770  006337  002516            ASL     UNITOP
 2649 013774  006337  002516            ASL     UNITOP          ;UNITOP := UNITOP * 16.
 2650 014000                            LET I := MJSIZE + MKSIZE
      014000  013737  002466  002602                                                 MOV MJSIZE,I
      014006  063737  002470  002602                                                 ADD MKSIZE,I
 2651 014014                            IF I LT UNITOP THEN LET I := UNITOP
      014014  023737  002602  002516                                                 CMP I,UNITOP
      014022  002003                                                                 BGE L157
      014024  013737  002516  002602                                                 MOV UNITOP,I
      014032                                                                L157:::::::
 2652 014032                            TYPE    $CRLF
      014032  104401  003010            TYPEIT  ,$CRLF
                                        .DSABL  CRF
```

```
2653 014036                                TYPDEC  I
     014036  013746  002602                MOV     I,-(SP) ;;SAVE I FOR TYPEOUT
     014042  104405                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                           .DSABL  CRF
2654 014044                                TYPE    MSG070
     014044  104401  115246                TYPEIT  ,MSG070
                                           .DSABL  CRF
2655 014050                                TYPDEC  MJSIZE
     014050  013746  002466                MOV     MJSIZE,-(SP)    ;;SAVE MJSIZE FOR TYPEOUT
     014054  104405                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                           .DSABL  CRF
2656 014056                                TYPE    MSG071
     014056  104401  115271                TYPEIT  ,MSG071
                                           .DSABL  CRF
2657 014062                                TYPDEC  MKSIZE
     014062  013746  002470                MOV     MKSIZE,-(SP)    ;;SAVE MKSIZE FOR TYPEOUT
     014066  104405                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                           .DSABL  CRF
2658 014070                                TYPE    MSG072
     014070  104401  115304                TYPEIT  ,MSG072
                                           .DSABL  CRF
2659 014074                                IF #SW6 SET.IN @SWR OR CONFGERROR IS TRUE
     014074  032777  000100  166664                                         BIT #SW6,@SWR
     014102  001003                                                        BNE L160
     014104  005737  002576                                                TST CONFGERROR
     014110  001402                                                        BEQ L161
     014112                                                         L160:::::::
2660 014112  004737  035402                  CALL PCONFIG
2661 014116                                END ;OF IF #SW6
     014116                                                         L161:::::::
```

```
 2664 014116                                    SUBTST  <<CHECK APT SIZING>>
                                               ;*****************************************************************************
                                               ;*SUBTEST       CHECK APT SIZING
                                               ;*****************************************************************************
 2665 014116                                    IF APTFLAG IS TRUE AND APTSIZE IS TRUE
      014116  005737  002444                                                    TST APTFLAG
      014122  001505                                                            BEQ L162
      014124  005737  002544                                                    TST APTSIZE
      014130  001502                                                            BEQ L162
 2666 014132  005037  002534                      CLR    TEMP
 2667 014136  012700  075164                      MOV    #$MAMS1,R0
 2668 014142                                      FOR R2 := #0 TO #4
      014142  005002                                                            CLR R2
      014144                                                          B24:::::::
 2669 014144                                        IFB 1(R0) NE #0
      014144  105760  000001                                                  TSTB 1(R0)
      014150  001441                                                           BEQ L163
 2670 014152  111001                                 MOVB       (R0),R1
 2671 014154  042701  177400                         BIC        #177400,R1
 2672 014160                                         IF 2(R0) LT #0
      014160  005760  000002                                                    TST 2(R0)
      014164  002002                                                           BGE L164
 2673 014166  000261                                   SEC
 2674 014170                                         ELSE
      014170  000401                                                            BR L165
      014172                                                          L164:::::::
 2675 014172  000241                                   'CLC
 2676 014174                                         END ;OF IF 2(R0)
      014174                                                          L165:::::::
 2677 014174  006101                                 ROL        R1
 2678 014176  005201                                 INC        R1              ;TO COMPENSATE FOR 4 BANKS BEING (0-3)
 2679 014200  006301                                 ASL        R1
 2680 014202  006301                                 ASL        R1
 2681 014204  006301                                 ASL        R1
 2682 014206  006301                                 ASL        R1
 2683 014210  163701  002534                         SUB        TEMP,R1
 2684 014214  010137  002534                         MOV        R1,TEMP
 2685 014220                                         IFB 1(R0) EQ #1
      014220  126027  000001  000001                                          CMPB 1(R0),#1
      014226  001002                                                           BNE L166
 2686 014230  060137  002522                           ADD      R1,APTCORE
 2687 014234                                         END ;OF 'FB 1(R0)
      014234                                                          L166:::::::
 2688 014234                                         IFB 1(R0) EQ #4
      014234  126027  000001  000004                                          CMPB 1(R0),#4
      014242  001002                                                           BNE L167
 2689 014244  060137  002524                           ADD      R1,APTMOS
 2690 014250                                         END ;OF IFB 1(R0)
      014250                                                          L167:::::::
 2691 014250  062700  000004                         ADD        #4,R0
 2692 014254                                       END ;OF IFB 1(R0)
      014254                                                          L163:::::::
 2693 014254                                     END ;OF FOR R2
      014254  005202                                                            INC R2
      014256  020227  000004                                                    CMP R2,#4
      014262  003730                                                           BLE B24
      014264                                                          E24:::::::
```

```
 2694 014264                            IF APTCORE NE MJSIZE OR APTMOS NE MKSIZE
      014264  023737  002522  002466                                          CMP APTCORE,MJSIZE
      014272  001004                                                         BNE L170
      014274  023737  002524  002470                                          CMP APTMOS,MKSIZE
      014302  001401                                                         BEQ L171
      014304                                                          L170:;;;;;;;
 2695 014304  104051                        ERROR       +51
 2696 014306                            END ;OF IF APTCORE
      014306                                                          L171:;;;;;;;
 2697
 2698                                   ;CHECK FOR CORRECT NUMBER OF CPU'S
 2699 014306  013700  002730             MOV   SLAVES,R0
 2700 014312  005200                     INC R0                ;R0 = 1, 2, 3, OR 4
 2701 014314                            IF $DDW6 NE R0
      014314  023700  075234                                                 CMP $DDW6,R0
      014320  001406                                                         BEQ L172
 2702 014322  010037  002050               MOV R0,GOOD
 2703 014326  013737  075234  002056       MOV $DDW6,BAD
 2704 014334  104065                       ERROR +65
 2705 014336                            END ;OF $DDW6
      014336                                                          L172:;;;;;;;
 2706 014336                        END ;OF IF APTFLAG
      014336                                                          L162:;;;;;;;
 2707
 2708 014336  004737  015104         CALL    DOBACK                ;WRITE BACKGROUND PATTERN
```

```
                                LOOP:   NEWTST  <<DIAGNOSTIC MODE DISPATCH ROUTINE>>
                                ;*******************************************************************************
                                ;*TEST 5         DIAGNOSTIC MODF DISPATCH ROUTINE
                                ;*******************************************************************************
     014342  000004             TST5:   SCOPE
2711 014344  005037  002332             CLR     CONTFLAG
2712 014350  017700  166412             MOV     @SWR,R0         ;GET SWITCHES
2713 014354  042700  177761             BIC     #^C16,R0        ;MASK TO ONLY MODE BITS
2714 014360  004770  014370             CALL    @DISPTBL(R0)    ;DISPATCH TO ROUTINE THROUGH NEXT TABLE
2715 014364  000137  014410             JMP     MEMDONE         ;GO TO NEXT TEST
2716 014370  015204             DISPTBL:BAFPAF  ;MODE 0;BANKS FORWARD, PATTERNS FORWARD
2717 014372  015320                     BAFPAR  ;MODE 1;BANKS FORWARD, PATTERNS REVERSE
2718 014374  015434                     BAWPAF  ;MODE 2;BANKS WORST FIRST, PATTERNS FORWARD
2719 014376  015572                     BAWPAR  ;MODE 3;BANKS WORST FIRST, PATTERNS REVERSF
2720 014400  015730                     PAFBAF  ;MODE 4;PATTERNS FORWARD, BANKS FORWARD
2721 014402  016056                     PAFBAW  ;MODE 5;PATTERNS FORWARD, BANKS WORST FIRST
2722 014404  016246                     PARBAF  ;MODE 6;PATTERNS REVERSE, BANKS FORWARD
2723 014406  016404                     PARBAW  ;MODE 7;PATTERNS REVERSE, BANKS WORST FIRST
2724                                    ;**NOTE** MARGINS FOLLOW PATTERNS (FORWARD IS (0,2,3,4,5))
2725                                    ;(REVERSE IS (5,4,3,2,0))
```

```
 2729 014410  004737  015104          MEMDONE:CALL    DOBACK                          ;CHECK BACKGROUND PATTERN
 2730 014414                                  NEWTST<<UNIQUE BANK TEST>>
                                      ;*************************************************************************
                                      ;*TEST 6        UNIQUE BANK TEST
                                      ;*************************************************************************
      014414  000004                  TST6:   SCOPE
 2731                                 ;MAKE SURE THAT EACH BANK CAN HAVE UNIQUE DATA
 2732                                 ;WRITE AND READ THE BANK NUMBER IN EACH BANK (EXCEPT WHERE THE PROGRAM IS)
 2733 014416                                  IF SELONLY IS FALSE
      014416  005737  002002                                                          TST SELONLY
      014422  001015                                                                  BNE L173
 2734 014424                                    SET   HEADER,MUT
      014424  012737  177777  002724                                                  MOV  #-1,HEADER
      014432  012737  177777  002116                                                  MOV  #-1,MUT
 2735 014440  004737  024370                    CALL  MT0027
 2736 014444                                    SET   HEADER
      014444  012737  177777  002724                                                  MOV  #-1,HEADER
 2737 014452  005037  002116                    CLR   MUT
 2738 014456                                  END ;OF IF SELONLY
      014456                                                                  L173:;;;;;;
 2739
 2740 014456                                  NEWTST  <<FORCE ADDRESS PARITY ERRORS>>
                                      ;*************************************************************************
                                      ;*TEST 7        FORCE ADDRESS PARITY ERRORS
                                      ;*************************************************************************
      014456  000004                  TST7:   SCOPE
 2741                                 ;THIS MAKES SURE THAT ALL ACCESSABLE MEMORY LOCATIONS WILL GIVE A
 2742                                 ;PARITY TRAP IF I FORCE A MEMORY BUSS ADDRESS PARITY ERROR BY
 2743                                 ;USING THE MAINTENANCE REGISTER.
 2744                                 ;
 2745                                 ;WHEN DONE EVERY ADDRESS PARITY ERROR LED IN EVERY MEMORY BOX
 2746                                 ;(MK11'S, MKA11'S, AND MJ11'S) SHOULD BE LITE.
 2747                                 ;YOU CAN ONLY TURN THEM OFF BY TURNING OFF POWER TO THE BOX'S.
 2748 014460                                  IF SELONLY IS FALSE
      014460  005737  002002                                                          TST SELONLY
      014464  001040                                                                  BNE L174
 2749 014466  012700  060000                    MOV   #FIRST,R0
 2750 014472  012737  000004  002100            MOV   #4,NOPAR                  ;INDICATE PARITY ACTION
 2751 014500                                    BMOV  ADDPAR
      014500  004537  043710                      JSR R5,BLOCK1
      014504  014570                              ADDPAR
                                                  .DSABL      CRF
 2752 014506                                    FOR BANK := #0 TO #167
      014506  005037  002106                                                          CLR BANK
      014512                                                                  B25:;;;;;;
 2753 014512  004737  042422                      CALL EXBANK
 2754 014516                                      IF ACFLAG IS TRUE
      014516  005737  002124                                                          TST ACFLAG
      014522  001411                                                                  BEQ L175
 2755 014524  005037  002074                        CLR       PARCNT
 2756 014530  004737  026042                        CALL SUPD01
 2757 014534                                        IF PARCNT NE #1
      014534  023727  002074  000001                                                  CMP PARCNT,#1
      014542  001401                                                                  BEQ L176
 2758 014544  104035                                  ERROR +35
 2759 014546                                        END ;OF IF PARCNT
      014546                                                                  L176:;;;;;;
```

```
2760 014546                                        END ;OF IF ACFLAG
     014546                                                                    L175:;;;;;;
2761 014546                                      END ;OF FOR BANK
     014546  005237  002106                                                        INC BANK
     014552  023727  002106  000167                                               CMP BANK,#167
     014560  003754                                                              BLE B25
     014562                                                                    E25:;;;;;;;;
2762 014562  005037  002100                        CLR   NOPAR                ;INDICATE PARITY ACTION
2763 014566                                    END ;OF IF SELONLY
     014566                                                                    L174:;;;;;;
2764 014566  000405                              BR      SUBAAU
2765
2766                                           ;THESE 3 INSTRUCTIONS ARE MOVED TO THE USER PAR'S IN ORDER TO
2767                                           ;CAUSE ABORTS FROM THE BANK UNDER TEST VICE THE PROGRAM SPACE
2768 014570  012737  000002  177750  ADDPAR: MOV     #BIT1,MAINT          ;V177640      ;CREATE ADDRESS PARITY ERROR
2769 014576  005710                           TST     (R0)                 ;V177646      ;THIS WILL ABORT & INCREMENT PARCNT
2770 014600  000207                           RETURN                       ;V177650
```

FORCE ADDRESS PARITY ERRORS SEQ 0690

```
2773 014602                            SUBAAU: IF SBEFLAG IS TRUE
     014602  005737  002022                                                  TST SBEFLAG
     014606  001405                                                          BEQ L177
2774 014610                              IF LASTERROR EQ $ERTTL
     014610  023737  002020  002754                                          CMP LASTERROR,$ERTTL
     014616  001001                                                          BNE L200
2775 014620  104050                        ERROR       +50
2776 014622                              END ;OF IF LASTERROR
     014622                                                          L200:::::::
2777 014622                            END ;OF IF SBEFLAG
     014622                                                          L177:::::::
2778
2779 014622                            SET     WRITEONLY
     014622  012737  177777  002502                                          MOV  #-1,WRITEONLY
2780 014630  005137  002744            COM     SOFTPAT
2781 014634  004737  015104            CALL    DOBACK                  ;RESTORE BACKGROUND PATTERN
2782 014640  005037  002502            CLR     WRITEONLY
2783 014644                            IF MULTIPORT IS TRUE THEN JUMPTO MAST01
     014644  005737  003014                                                  TST MULTIPORT
     014650  001402                                                          BEQ L201
     014652  000137  057372                                                  JMP MAST01
     014656                                                          L201:::::::
2784 014656                            FLUSH:  SUBTST  <<FLUSH OUT DBE'S>>
                                       ;*****************************************************************
                                       ;*SUBTEST       FLUSH OUT DBE'S
                                       ;*****************************************************************
2785 014656  004737  024754            CALL    MT0030
```

```
                                        .SBTTL  END OF PASS ROUTINE
                                ;*******************************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*INDICATE END-OF-PROGRAM AFTER EACH PASSES THRU THE PROGRAM
                                ;*TYPE 'END PASS #XXXXX' (WHERE XXXXX IS A DECIMAL NUMBER)
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO LOOP
014662  005037  002022          $EOP:   CLR     SBEFLAG
014666  005037  002542                  CLR     FSINFLAG
014672  013737  002754  002020          MOV     $ERTTL,LASTERROR
014700  005237  075142                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
014704  042737  100000  075142          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
014712                                  TYPE    MSG077          ;;TYPE 'END PASS #'
014712  104401  115414                  TYPEIT  ,MSG077
                                        .DSABL  CRF
014716                                  IF #SW11 SET.IN @SWR OR QVFLAG IS TRUE
014716  032777  004000  166042                                                  BIT #SW11,@SWR
014724  001003                                                                  BNE L202
014726  005737  002440                                                          TST QVFLAG
014732  001404                                                                  BEQ L203
014734                                                                  L202:::::::
014734                                    TYPE  MSG035          ;QV
014734  104401  113707                  TYPEIT  ,MSG035
                                        .DSABL  CRF
014740  005037  002440                    CLR   QVFLAG
014744                                  END ;OF IF SW11
014744                                                                  L203:::::::
014744                                  TYPDEC  $PASS
014744  013746  075142                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
014750  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                        .DSABL  CRF
014752  013700  000042                  MOV     42,R0           ;;GET MONITOR ADDRESS
014756  001430                          BEQ     $DOAGAIN        ;;BRANCH IF NO MONITOR
014760  022700  002000          $ZAP42: CMP     #STACK,R0       ;ARE WE UNDER RT11
014764  001425                          BEQ     $DOAGAIN        ;YES - BRANCH
                                        ;WE ARE UNDER (HEAVEN HELP US) XXDP'
014766                                  PUSH    R0
014766  010046                                                                  MOV R0,-(SP)
014770  004737  043554                  CALL    SHUTUP
014774                                  POP     R0
014774  012600                                                                  MOV (SP)+,R0
014776  000005                          RESET                   ;;CLEAR THE WORLD
015000  004710                  $ENDAD: CALL    (R0)            ;;GO TO MONITOR
015002  000240                          NOP                     ;;SAVE ROOM
015004  000240                          NOP                     ;;FOR
015006  000240                          NOP                     ;;ACT11
015010                          $DOAGN: ;UNDO SHUTUP STUFF
                                        ;       RESTORE STACK
                                        ;       ENERGIZE UNIBUS MAP & 22 BIT ADDRESSING
                                        ;       ENERGIZE MEMORY MANAGEMENT
                                        ;       PUT LOADERS BACK HOME
015010  013706  002706                  MOV     KSTACK,SP
015014  052737  000060  172516          BIS     #BIT5!BIT4,MMR3
015022  104420                          ENERGIZE                ;TURN ON MEMORY MANAGEMENT
015024  013700  002710                  MOV     LOADHOME,R0             ;DESTINATION BANK
015030  012701  000001                  MOV     #1,R1                   ;SOURCE BANK
015034  004737  042072                  CALL    BANKMOV
```

END OF PASS ROUTINE SEQ 0692

```
 2831 015040                          $DOAGAIN:IF $USWR EQ $PASS      ;IF APT LIMITING # OF PASSES
      015040  023737  075160  075142                                                  CMP $USWR,$PASS
      015046  001014                                                                 BNE L204
 2832 015050  012701  000050          APTHANG:  MOV   #50,R1
 2833 015054  077001                  2$:       SOB   R0,2$
 2834 015056  062737  000001  075144            ADD   #1,$DEVCT
 2835 015064  005537  075146                    ADC   $UNIT
 2836 015070  077107                            SOB   R1,2$
 2837 015072  005237  075142                    INC   $PASS
 2838 015076  000764                            BR    APTHANG
 2839 015100                                  END ;OF IF $USWR
      015100                                                                 L204:;;;;;;
 2840 015100  000137  014342                    JMP   LOOP              ;RETURN
```

```
 2843 015104                        DOBACK: SUBTST  <<WRITE BACKGROUND PATTERNS>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       WRITE BACKGROUND PATTERNS
                                    ;*****************************************************************************
 2844 015104  005037  002120                CLR     PATTERN
 2845 015110                                FOR BANK := #0 TO #167
      015110  005037  002106                                                                  CLR BANK
      015114                                                                        B26:::::::
 2846 015114  004737  042422                  CALL  EXBANK
 2847 015120                                  IF ACFLAG IS TRUE AND PFLAG IS FALSE
      015120  005737  002124                                                                  TST ACFLAG
      015124  001420                                                                        BEQ L205
      015126  005737  002130                                                                  TST PFLAG
      015132  001015                                                                        BNE L205
 2848 015134                                    SET          HEADER,MUT
      015134  012737  177777  002724                                                        MOV  #-1,HEADER
      015142  012737  177777  002116                                                        MOV  #-1,MUT
 2849 015150  004737  021222                    CALL         MKTEST          ;CALL   MJTEST WOULD ALSO WORK
 2850 015154  005037  002116                    CLR          MUT
 2851 015160                                    SET          HEADERR
      015160  012737  177777  002724                                                        MOV  #-1,HEADERR
 2852 015166                                  END ;OF IF ACFLAG
      015166                                                                        L205:::::::
 2853 015166                                END ;OF FOR BANK
      015166  005237  002106                                                                  INC BANK
      015172  023727  002106  000167                                                        CMP BANK,#167
      015200  003745                                                                        BLE B26
      015202                                                                        E26:::::::
 2854 015202  000207                        RETURN
```

```
                                        .SBTTL  MTEST MODES

015204                          BAFPAF: SUBTST  <<BANKS FORWARD,PATTERNS FORWARD      **RECURSIVE**>>
                                ;*****************************************************************************
                                ;*SUBTEST        BANKS FORWARD,PATTERNS FORWARD      **RECURSIVE**
                                ;*****************************************************************************
015204  005037  002106                  CLR     BANK            ;SET BANK TO 0
                                        ;START OF BANK LOOP
015210  004737  042422          1$:     CALL    EXBANK          ;EXAMINE BANK
015214  005737  002124                  TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
015220  001417                          BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
015222  005737  002132                  TST     RRFLAG          ;RELOCATION REQUIRED?
015226  001014                          BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
015230  005037  002120                  CLR     PATTERN         ;SET PATTERN TO 0
                                        ;START OF PATTERN LOOP
015234  005037  002112          2$:     CLR     MARGIN          ;SET MARGIN TO 0
                                        ;START OF MARGIN LOOP
015240  004737  016564          3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
                                        ;TERMINATION OF MARGIN LOOP
015244  004737  043006                  CALL    INCMAR          ;NEXT HIGHER MARGIN
015250  001373                          BNE     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
                                        ;TERMINATION OF PATTERN LOOP
015252  004737  042746                  CALL    INCPAT          ;GO SEE IF THIS IS THE LAST PATTERN
015256  001366                          BNE     2$              ;NO - LOOP ON THIS PATTERN
                                        ;TERMINATION OF BANK LOOP
015260  004737  042772          4$:     CALL    INCBNK          ;NEXT HIGHER BANK
015264  001351                          BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
                                        ;END OF LOOPS
015266  005737  002134                  TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
015272  001401                          BEQ     5$              ;NO - SKIP
015274  000207                          RETURN                  ;YES - RETURN
015276  004737  041130          5$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
015302                                  ON.ERROR THEN $RETURN
015302  103001                                                                  BCC L206
015304  000207                                                                  RTS PC
015306                                                                  L206:::::::
                                ;**NOTE** RECURSIVE CALL
015306  004737  015204                  CALL    BAFPAF          ;CALL SELF
015312  004737  041604                  CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
015316  000207                          RETURN
```

```
 2893 015320                        BAFPAR: SUBTST  <<BANKS FORWARD,PATTERNS REVERSE      **RECURSIVE**>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       BANKS FORWARD,PATTERNS REVERSE      **RECURSIVE**
                                    ;*****************************************************************************
 2894 015320  005037  002106               CLR     BANK            ;SET BANK TO 0
 2895                               ;START OF BANK LOOP
 2896 015324  004737  042422        1$:     CALL    EXBANK          ;EXAMINE BANK
 2897 015330  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 2898 015334  001417                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2899 015336  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
 2900 015342  001014                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 2901 015344  004737  042762               CALL    SETPAT          ;SET HIGH PATTERN FOR CORRECT MEMORY
 2902                               ;START OF PATTERN LOOP
 2903 015350  004737  043212        2$:     CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
 2904                               ;START OF MARGIN LOOP
 2905 015354  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 2906                               ;TERMINATION OF MARGIN LOOP
 2907 015360  004737  043152               CALL    DECMAR          ;NEXT LOWER MARGIN
 2908 015364  100373                       BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 2909                               ;TERMINATION OF PATTERN LOOP
 2910 015366  005337  002120               DEC     PATTERN         ;IS THIS THE LAST PATTERN?
 2911 015372  100366                       BPL     2$              ;NO - LOOP ON THIS PATTERN
 2912                               ;TERMINATION OF BANK LOOP
 2913 015374  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 2914 015400  001351                       BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
 2915                               ;END OF LOOPS
 2916 015402  005737  002134               TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 2917 015406  001401                       BEQ     5$              ;NO - SKIP
 2918 015410  000207                       RETURN                  ;YES - RETURN
 2919 015412  004737  041130        5$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 2920 015416                               ON.ERROR THEN $RETURN
      015416  103001                                                                  BCC L207
      015420  000207                                                                  RTS PC
      015422                                                                 L207::::::
 2921                               ;**NOTE** RECURSIVE CALL
 2922 015422  004737  015320               CALL    BAFPAR          ;CALL SELF
 2923 015426  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 2924 015432  000207                       RETURN
```

```
 2927 015434                        BAWPAF: SUBTST  <<BANKS WORST FIRST,PATTERNS FORWARD  **RECURSIVE**>>
                                    ;*********************************************************************
                                    ;*SUBTEST       BANKS WORST FIRST,PATTERNS FORWARD  **RECURSIVE**
                                    ;*********************************************************************
 2928 015434  005037  002106               CLR     BANK            ;SET BANK TO 0
 2929                               ;START OF BANK LOOP
 2930 015440  004737  042422        1$:     CALL    EXBANK          ;EXAMINE BANK
 2931 015444  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 2932 015450  001422                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2933 015452  005737  002136               TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)?
 2934 015456  001417                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2935 015460  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
 2936 015464  001014                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 2937 015466  005037  002120               CLR     PATTERN         ;SET PATTERN TO 0
 2938                               ;START OF PATTERN LOOP
 2939 015472  005037  002112        2$:     CLR     MARGIN          ;SET MARGIN TO 0
 2940                               ;START OF MARGIN LOOP
 2941 015476  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 2942                               ;TERMINATION OF MARGIN LOOP
 2943 015502  004737  043006               CALL    INCMAR          ;NEXT HIGHER MARGIN
 2944 015506  001373                       BNE     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 2945                               ;TERMINATION OF PATTERN LOOP
 2946 015510  004737  042746               CALL    INCPAT          ;GO SEE IF THIS IS THE LAST PATTERN
 2947 015514  001366                       BNE     2$              ;NO - LOOP ON THIS PATTERN
 2948                               ;TERMINATION OF BANK LOOP
 2949 015516  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 2950 015522  001346                       BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
 2951                               ;END OF LOOPS
 2952 015524  005137  002712               COM     WORST           ;IS THIS AN EVEN NUMBERED PASS?
 2953 015530  001003                       BNE     5$              ;YES - SKIP
 2954                               ;**NOTE** RECURSIVE CALL
 2955 015532  004737  015434               CALL    BAWPAF          ;CALL SELF
 2956 015536  000207                       RETURN
 2957 015540  005737  002134        5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 2958 015544  001401                       BEQ     6$              ;NO - SKIP
 2959 015546  000207                       RETURN                  ;YES - RETURN
 2960 015550  004737  041130        6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 2961 015554                               ON.ERROR THEN $RETURN
      015554  103001                                                                  BCC L210
      015556  000207                                                                  RTS PC
      015560                                                                L210:::::::
 2962                               ;**NOTE** RECURSIVE CALL
 2963 015560  004737  015434               CALL    BAWPAF          ;CALL SELF
 2964 015564  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 2965 015570  000207                       RETURN
```

```
 2968 015572                        BAWPAR: SUBTST  <<BANKS WORST FIRST,PATTERNS REVERSE  **RECURSIVE**>>
                                    ;*************************************************************************
                                    ;*SUBTEST       BANKS WORST FIRST,PATTERNS REVERSE  **RECURSIVE**
                                    ;*************************************************************************
 2969 015572  005037  002106               CLR     BANK            ;SET BANK TO 0
 2970                               ;START OF BANK LOOP
 2971 015576  004737  042422        1$:     CALL    EXBANK          ;EXAMINE BANK
 2972 015602  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 2973 015606  001422                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2974 015610  005737  002136               TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
 2975 015614  001417                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 2976 015616  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
 2977 015622  001014                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 2978 015624  004737  042762               CALL    SETPAT          ;SET HIGH PATTERN FOR CORRECT MEMORY
 2979                               ;START OF PATTERN LOOP
 2980 015630  004737  043212        2$:     CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
 2981                               ;START OF MARGIN LOOP
 2982 015634  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 2983                               ;TERMINATION OF MARGIN LOOP
 2984 015640  004737  043152               CALL    DECMAR          ;NEXT LOWER MARGIN
 2985 015644  100373                       BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 2986                               ;TERMINATION OF PATTERN LOOP
 2987 015646  005337  002120               DEC     PATTERN         ;IS THIS THE LAST PATTERN?
 2988 015652  100366                       BPL     2$              ;NO - LOOP ON THIS PATTERN
 2989                               ;TERMINATION OF BANK LOOP
 2990 015654  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 2991 015660  001346                       BNE     1$              ;IF NOT DONE - LOOP ON THIS BANK
 2992                               ;END OF LOOPS
 2993 015662  005137  002712               COM     WORST           ;IS THIS AN EVEN NUMBERED PASS?
 2994 015666  001003                       BNE     5$              ;YES - SKIP
 2995                               ;**NOTE** RECURSIVE CALL
 2996 015670  004737  015572               CALL    BAWPAR          ;CALL SELF
 2997 015674  000207                       RETURN
 2998 015676  005737  002134        5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 2999 015702  001401                       BEQ     6$              ;NO - SKIP
 3000 015704  000207                       RETURN                  ;YES - RETURN
 3001 015706  004737  041130        6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 3002 015712                               ON.ERROR THEN $RETURN
      015712  103001                                                                  BCC L211
      015714  000207                                                                  RTS PC
      015716                                                                L211:::::::
 3003                               ;**NOTE** RECURSIVE CALL
 3004 015716  004737  015572               CALL    BAWPAR          ;CALL SELF
 3005 015722  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 3006 015726  000207                       RETURN
```

```
 3010 0'5730                        PAFBAF: SUBTST  <<PATTERNS FORWARD,BANKS FORWARD      **RECURSIVE**>>
                                    ;*********************************************************************
                                    ;*SUBTEST       PATTERNS FORWARD,BANKS FORWARD      **RECURSIVE**
                                    ;*********************************************************************
 3011 015730  005037  002120               CLR     PATTERN          ;SET PATTERN TO 0
 3012                               ;START OF PATTERN LOOP
 3013 015734  005037  002106        1$:     CLR     BANK             ;SET BANK TO 0
 3014                               ;START OF BANK LOOP
 3015 015740  004737  042422        2$:     CALL    EXBANK           ;EXAMINE BANK
 3016 015744  004737  042730               CALL    BANKOK           ;CORRECT MEMORY FOR THIS BANK?
 3017 015750  001015                       BNE     4$               ;NO - GO TO BANK LOOP TERMINATOR
 3018 015752  005737  002124               TST     ACFLAG           ;CAN WE ACCESS THIS BANK?
 3019 015756  001412                       BEQ     4$               ;NO - GO TO BANK LOOP TERMINATION
 3020 015760  005737  002132               TST     RRFLAG           ;RELOCATION REQUIRED?
 3021 015764  001007                       BNE     4$               ;YES - GO TO BANK LOOP TERMINATION
 3022 015766  005037  002112               CLR     MARGIN           ;SET MARGIN TO 0
 3023                               ;START OF MARGIN LOOP
 3024 015772  004737  016564        3$:     CALL    MTEST            ;GO TEST CORRECT MEMORY
 3025                               ;TERMINATION OF MARGIN LOOP
 3026 015776  004737  043006               CALL    INCMAR           ;NEXT HIGHER MARGIN
 3027 016002  001373                       BNE     3$               ;IF NOT DONE - LOOP ON THIS MARGIN
 3028                               ;TERMINATION OF BANK LOOP
 3029 016004  004737  042772        4$:     CALL    INCBNK           ;NEXT HIGHER BANK
 3030 016010  001353                       BNE     2$               ;IF NOT DONE - LOOP ON THIS BANK
 3031                               ;TERMINATION OF PATTERN LOOP
 3032 016012  004737  042746               CALL    INCRPT           ;NEXT HIGHER PATTERN
 3033 016016  001346                       BNE     1$               ;OK - LOOP; ELSE CONTINUE
 3034                               ;END OF LOOPS
 3035 016020  005137  002140               COM     TMFLAG           ;COMPLEMENT TYPE OF MEMORY
 3036                                                                ;IS THIS AN EVEN NUMBER PASS?
 3037 016024  001403                       BEQ     5$               ;YES - SKIP
 3038                               ;**NOTE** RECURSIVE CALL
 3039 016026  004737  015730               CALL    PAFBAF           ;CALL SELF
 3040 016032  000207                       RETURN
 3041 016034  005737  002134        5$:     TST     RLFLAG           ;HAVE WE BEEN RELOCATED?
 3042 016040  001401                       BEQ     6$               ;NO - SKIP
 3043 016042  000207                       RETURN                   ;YES - RETURN
 3044 016044  004737  041130        6$:     CALL    RELOCATE         ;MOVE & MAP PROGRAM
 3045 016050                               ON.ERROR THEN $RETURN
      016050  103001                                                                  BCC L212
      016052  000207                                                                  RTS PC
      016054                                                                L212:::::::
 3046                               ;**NOTE** RECURSIVE CALL
 3047 016054  004737  015730               CALL    PAFBAF           ;CALL SELF
 3048 016060  004737  041604               CALL    UNRELOCATE       ;UNMOVE & UNMAP PROGRAM
 3049 016064  000207                       RETURN
```

```
 3052 016066                        PAFBAW: SUBTST  <<PATTERNS FORWARD,BANKS WORST FIRST  **RECURSIVE**>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       PATTERNS FORWARD,BANKS WORST FIRST  **RECURSIVE**
                                    ;*****************************************************************************
 3053 016066  005037  002120               CLR     PATTERN         ;SET PATTERN TO 0
 3054                                       ;START OF PATTERN LOOP
 3055 016072  005037  002106        1$:     CLR     BANK            ;SET BANK TO 0
 3056                                       ;START OF BANK LOOP
 3057 016076  004737  042422        2$:     CALL    EXBANK          ;EXAMINE BANK
 3058 016102  004737  042730                CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
 3059 016106  001020                        BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
 3060 016110  005737  002124                TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 3061 016114  001415                        BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 3062 016116  005737  002136                TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
 3063 016122  001412                        BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 3064 016124  005737  002132                TST     RRFLAG          ;RELOCATION REQUIRED?
 3065 016130  001007                        BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 3066 016132  005037  002112                CLR     MARGIN          ;SET MARGIN TO 0
 3067                                       ;START OF MARGIN LOOP
 3068 016136  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 3069                                       ;TERMINATION OF MARGIN LOOP
 3070 016142  004737  043006                CALL    INCMAR          ;NEXT HIGHER MARGIN
 3071 016146  001373                        BNE     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 3072                 6176    000207                                RETURN
 3085 016200  005137  002712        5$:     COM     WORST           ;4TH PASS?
 3086 016204  001003                        BNE     6$              ;YES - SKIP
 3087                                       ;**NOTE** RECURSIVE CALL
 3088 016206  004737  016066                CALL    PAFBAW          ;CALL SELF
 3089 016212  000207                        RETURN
 3090 016214  005737  002134        6$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 3091 016220  001401                        BEQ     7$              ;NO - SKIP
 3092 016222  000207                        RETURN                  ;YES - RETURN
 3093 016224  004737  041130        7$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 3094 016230                                ON.ERROR THEN $RETURN
      016230  103001                                                                  BCC L213
      016232  000207                                                                  RTS PC
      016234                                                                L213:::::::
 3095                                       ;**NOTE** RECURSIVE CALL
 3096 016234  004737  016066                CALL    PAFBAW          ;CALL SELF
 3097 016240  004737  041604                CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 3098 016244  000207                        RETURN
```

```
                                                                                                    SEQ 0700

 3101 016246                    PARBAF: SUBTST  <<PATTERNS REVERSE,BANKS FORWARD      **RECURSIVE**>>
                                ;*********************************************************************
                                ;*SUBTEST       PATTERNS REVERSE,BANKS FORWARD      **RECURSIVE**
                                ;*********************************************************************
 3102 016246  004737  042762           CALL    HIPAT           ;SET HIGHTEST PATTERNS
 3103                                   ;START OF PATTERN LOOP
 3104 016252  005037  002106    1$:     CLR     BANK            ;SET BANK TO 0
 3105                                   ;START OF BANK LOOP
 3106 016256  004737  042422    2$:     CALL    EXBANK          ;EXAMINE BANK
 3107 016262  004737  042730            CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
 3108 016266  001015                    BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
 3109 016270  005737  002124            TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
 3110 016274  001412                    BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
 3111 016276  005737  002132            TST     RRFLAG          ;RELOCATION REQUIRED?
 3112 016302  001007                    BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
 3113 016304  004737  043212            CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
 3114                                   ;START OF MARGIN LOOP
 3115 016310  004737  016564    3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
 3116                                   ;TERMINATION OF MARGIN LOOP
 3117 016314  004737  043152            CALL    DECMAR          ;NEXT LOWER MARGIN
 3118 016320  100373                    BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
 3119                                   ;TERMINATION OF BANK LOOP
 3120 016322  004737  042722    4$:     CALL    INCBNK          ;NEXT HIGHER BANK
 3121 016326  001353                    BNE     2$              ;IF NOT DONE - LOOP ON THIS BANK
 3122                                   ;TERMINATION OF PATTERN LOOP
 3123 016330  005337  002120            DEC     PATTERN         ;NEXT LOWER PATTERN
 3124 016334  100346                    BPL     1$              ;OK - LOOP; ELSE CONTINUE
 3125                                   ;END OF LOOPS
 3126 016336  005137  002140            COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
 3127                                                           ;IS THIS AN EVEN NUMBER PASS?
 3128 016342  001403                    BEQ     5$              ;YES - SKIP
 3129                                   ;**NOTE** RECURSIVE CALL
 3130 016344  004737  016246            CALL    PARBAF          ;CALL SELF
 3131 016350  000207                    RETURN
 3132 016352  005737  002134    5$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
 3133 016356  001401                    BEQ     6$              ;NO - SKIP
 3134 016360  000207                    RETURN                  ;YES - RETURN
 3135 016362  004737  041130    6$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
 3136 016366                            ON.ERROR THEN $RETURN
      016366  103001                                                            BCC L214
      016370  000207                                                            RTS PC
      016372                                                          L214:::::::
 3137                                   ;**NOTE** RECURSIVE CALL
 3138 016372  004737  016246            CALL    PARBAF          ;CALL SELF
 3139 016376  004737  041604            CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
 3140 016402  000207                    RETURN
```

```
3143 016404                        PARBAW: SUBTST  <<PATTERNS REVERSE,BANKS WORST FIRST  **RECURSIVE**>>
                                   ;*************************************************************************
                                   ;*SUBTEST       PATTERNS REVERSE,BANKS WORST FIRST  **RECURSIVE**
                                   ;*************************************************************************
3144 016404  004737  042762               CALL    HIPAT           ;SET HIGHTEST PATTERN
3145                                       ;START OF PATTERN LOOP
3146 016410  005037  002106        1$:     CLR     BANK            ;SET BANK TO 0
3147                                       ;START OF BANK LOOP
3148 016414  004737  042422        2$:     CALL    EXBANK          ;EXAMINE BANK
3149 016420  004737  042730               CALL    BANKOK          ;CORRECT MEMORY FOR THIS BANK?
3150 016424  001020                       BNE     4$              ;NO - GO TO BANK LOOP TERMINATOR
3151 016426  005737  002124               TST     ACFLAG          ;CAN WE ACCESS THIS BANK?
3152 016432  001415                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
3153 016434  005737  002136               TST     BMFLAG          ;IS THIS BAD MEMORY (WORST FIRST)
3154 016440  001412                       BEQ     4$              ;NO - GO TO BANK LOOP TERMINATION
3155 016442  005737  002132               TST     RRFLAG          ;RELOCATION REQUIRED?
3156 016446  001007                       BNE     4$              ;YES - GO TO BANK LOOP TERMINATION
3157 016450  004737  043212               CALL    SETMAR          ;SET HIGH MARGINS (IF NOT INHIBITED)
3158                                       ;START OF MARGIN LOOP
3159 016454  004737  016564        3$:     CALL    MTEST           ;GO TEST CORRECT MEMORY
3160                                       ;TERMINATION OF MARGIN LOOP
3161 016460  004737  043152               CALL    DECMAR          ;NEXT LOWER MARGIN
3162 016464  100373                       BPL     3$              ;IF NOT DONE - LOOP ON THIS MARGIN
3163                                       ;TERMINATION OF BANK LOOP
3164 016466  004737  042772        4$:     CALL    INCBNK          ;NEXT HIGHER BANK
3165 016472  001350                       BNE     2$              ;IF NOT DONE - LOOP ON THIS BANK
3166                                       ;TERMINATION OF PATTERN LOOP
3167 016474  005337  002120               DEC     PATTERN         ;NEXT LOWER PATTERN
3168 016500  100343                       BPL     1$              ;OK - LOOP; ELSE CONTINUE
3169                                       ;END OF LOOPS
3170 016502  005137  002140               COM     TMFLAG          ;COMPLEMENT TYPE OF MEMORY
3171                                                               ;IS THIS AN EVEN NUMBER PASS?
3172 016506  001403                       BEQ     5$              ;YES - SKIP
3173                                       ;**NOTE** RECURSIVE CALL
3174 016510  004737  016404               CALL    PARBAW          ;CALL SELF
3175 016514  000207                       RETURN
3176 016516  005137  002712        5$:     COM     WORST           ;4TH PASS?
3177 016522  001003                       BNE     6$              ;YES - SKIP
3178                                       ;**NOTE** RECURSIVE CALL
3179 016524  004737  016404               CALL    PARBAW          ;CALL SELF
3180 016530  000207                       RETURN
3181 016532  005737  002134        6$:     TST     RLFLAG          ;HAVE WE BEEN RELOCATED?
3182 016536  001401                       BEQ     7$              ;NO - SKIP
3183 016540  000207                       RETURN                  ;YES - RETURN
3184 016542  004737  041130        7$:     CALL    RELOCATE        ;MOVE & MAP PROGRAM
3185 016546                                ON.ERROR THEN $RETURN
     016546  103001                                                        BCC L215
     016550  000207                                                        RTS PC
     016552                                                          L215:::::::
3186                                       ;**NOTE** RECURSIVE CALL
3187 016552  004737  016404               CALL    PARBAW          ;CALL SELF
3188 016556  004737  041604               CALL    UNRELOCATE      ;UNMOVE & UNMAP PROGRAM
3189 016562  000207                       RETURN
```

```
3193 016564                            MTEST:  SUBTST  <<SUBR  SETUP MEMORY TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SUBR    SETUP MEMORY TEST
                                       ;*****************************************************************************
3194 016564  013700  002112                   MOV     MARGIN,R0
3195 016570  006300                           ASL     R0
3196 016572  010037  177750                   MOV     R0,MAINT                ;SET MARGINS
3197 016576                                   SET     HEADER                  ;INITIALIZE HEADER MESSAGE TYPEOUT
     016576  012737  177777  002724                                                   MOV  #-1,HEADER
3198 016604                                   SET     MUT                     ;INDICATE THERE IS A MEMORY UNDER TEST
     016604  012737  177777  002116                                                   MOV  #-1,MUT
3199 016612  005037  002362                   CLR     PASFLG
3200 016616  005737  002126                   TST     MKFLAG                  ;MK11?
3201 016622  001410                           BEQ     2$                      ;NO - SKIP
3202                                          ;IF CONTFLAG IS FALSE THEN CALL MKCONTROL
3203 016624  005737  002332                   TST     CONTFLAG
3204 016630  001002                           BNE     1$
3205 016632  004737  016664                   CALL    MKCONTROL
3206 016636  004737  021222           1$:     CALL    MKTEST                  ;YES - DO MK11 TESTS
3207 016642  000402                           BR      3$
3208 016644  004737  021512           2$:     CALL    MJTEST                  ;DO MJ11 TESTS
3209 016650  005037  002116           3$:     CLR     MUT                     ;NOW - NO MEMORY UNDER TEST
3210 016654                                   SET     HEADER                  ;ALLOW HEADERS NORMAL
     016654  012737  177777  002724                                                   MOV  #-1,HEADER
3211 016662  000207                           RETURN
```

```
3214 016664                          MKCONTROL:SUBTST        <<SUBR  TEST MK11 CONTROLLER LOGIC DISPATCH>>
                                     ;*********************************************************************
                                     ;*SUBTEST       SUBR    TEST MK11 CONTROLLER LOGIC DISPATCH
                                     ;*********************************************************************
3215                                         ;THIS MODULE AND THE NEXT FEW PAGES SOLVE THE PROBLEM OF
3216                                         ;HOW TO RUN THE CSR TESTS ON EACH MK11 MEMORY
3217                                         ;
3218                                         ;IN ORDER TO TEST EACH CONTROLLER (2 PER BOX) I MUST DO
3219                                         ;  EACH EXISTING BOX
3220                                         ;    IF ECC IS NOT DISABLED
3221                                         ;      EACH SIDE OF EACH BOX
3222                                         ;        FIND THE ADDRESS OF THIS SIDE (DEPENDS ON INTERLEAVE)
3223                                         ;          FIND A LOCATION THAT HAS NO SINGLE BIT ERRORS
3224                                         ;            RUN ALL CSR TESTS
3225                                         ;      NEXT SIDE
3226                                         ;  NEXT BOX
3227 016664                                  IF SELONLY IS TRUE THEN $RETURN
      016664  005737  002002                                                      TST SELONLY
      016670  001401                                                              BEQ L216
      016672  000207                                                              RTS PC
      016674                                                                L216:::::::
3228 016674                                  PUSH    BANK
      016674  013746  002106                                                      MOV BANK,-(SP)
3229 016700  112737  000200  002416         MOVB    #200,CSRINDEX           ;SET BIT FOR CONTROLLER
3230 016706  112737  000001  002417         MOVB    #1,CSROUDEX             ;SET BIT FOR CONTROLLER
3231 016714                                  FOR CSRLOOP := #'0 TO #'7
      016714  012737  000060  002420                                                      MOV #'0,CSRLOOP
      016722                                                                B27:::::::
3232 016722                                    IFB CSRINDEX SET.IN MKCSRS
      016722  133737  002416  002334                                                      BITB CSRINDEX,MKCSRS
      016730  001537                                                              BEQ L217
3233 016732  004737  017300                    CALL        ISECCON
3234 016736                                    FOR SIDE := #'0 TO #'1
      016736  012737  000060  002422                                                      MOV #'0,SIDE
      016744                                                                B30:::::::
3235 016744  004737  017610                      CALL      INTKRAP
3236 016750                                      BEGIN CSRSTUFF
      016750                                                                B31:::::::
3237 016750  005037  002424                      CLR       SUCCESS
3238 016754                                      FOR BANK := CSRLBANK DOWNTO CSRFBANK
      016754  013737  002412  002106                                                      MOV CSRLBANK,BANK
      016762                                                                B32:::::::
3239 016762  004737  042422                        CALL    EXBANK
3240 016766                                        IF ACFLAG IS TRUE AND RRFLAG IS FALSE
      016766  005737  002124                                                      TST ACFLAG
      016772  001467                                                              BEQ L220
      016774  005737  002132                                                      TST RRFLAG
      017000  001064                                                              BNE L220
3241 017002                                          MAP   BANK                ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
      017002  010346                                                              MOV R3,-(SP)
      017004  013703  002106                MOV     BANK,R3
      017010  004737  040700                CALL    MAPPER
                                             .DSABL  CRF
      017014  012603                                                              MOV (SP)+,R3
3242 017016  104511                            INVALIDATE          ;INVALIDATE BACKGROUND PATTERN ON "BANK"
3243 017020  000241                            CLC
3244 017022                                    IF SPECIAL IS TRUE THEN $CALL SIDEOK
```

```
                017022  005737  002432                                                          TST SPECIAL
                017026  001402                                                                  BEQ L221
                017030  004737  021066                                                          JSR PC,SIDEOK
                017034                                                                  L221:::::::
3245            017034                          ON.NOERROR
                017034  103446                                                                  BCS L222
3246            017036            FOR TESTADD := CSRFIRST TO #LAST BY CSRINC
                017036  013737  002336  002506                                                 MOV CSRFIRST,TESTADD
                017044                                                                  B33:::::::
3247            017044  004737  017374              CALL      SBETEST
3248            017050            ON.NOERROR
                017050  103431                                                                  BCS L223
3249            017052  104424              CACHOFF                     ;TURN CACHE OFF
3250            017054              FOR I := #0 TO #37
                017054  005037  002602                                                         CLR I
                017060                                                                  B34:::::::
3251            017060  005037  002100                CLR   NOPAR       ;INDICATE PARITY ACTION
3252            017064                                SET   HEADER
                017064  012737  177777  002724                                                 MOV  #-1,HEADER
3253            017072  005037  002362                CLR   PASFLG
3254            017076                                LET R0 := I
                017076  013700  002602                                                         MOV I,R0
3255            017102  004737  020114                CALL CSRCASE
3256            017106              END ;OF FOR I
                017106  005237  002602                                                         INC I
                017112  023727  002602  000037                                               CMP I,#37
                017120  003757                                                                  BLE B34
                017122                                                                  E34:::::::
3257            017122  104423              CACHON                      ;TURN CACHE ON
3258            017124              SET       SUCCESS
                017124  012737  177777  002424                                                 MOV  #-1,SUCCESS
3259            017132              LEAVE CSRSTUFF
                017132  000415                                                                  BR E31
3260            017134            END ;OF ON.NOERROR
                017134                                                                  L223:::::::
3261            017134          END ;OF FOR TESTADD
                017134  063737  002414  002506                                                 ADD CSRINC,TESTADD
                017142  023727  002506  157776                                               CMP TESTADD,#LAST
                017150  003735                                                                  BLE B33
                017152                                                                  E33:::::::
3262            017152              END ;OF ON.NOERROR
                017152                                                                  L222:::::::
3263            017152          END ;OF IF
                017152                                                                  L220:::::::
3264            017152        END ;OF FOR BANK
                017152  005337  002106                                                         DEC BANK
                017156  023737  002106  002410                                               CMP BANK,CSRFBANK
                017164  002276                                                                  BGE B32
                017166                                                                  E32:::::::
3265            017166        END CSRSTUFF
                017166                                                                  E31:::::::
3266            017166        IF SUCCESS IS FALSE
                017166  005737  002424                                                         TST SUCCESS
                017172  001010                                                                  BNE L224
3267            017174  113737  002420  113625    MOVB    CSRLOOP,MSGA34    ;SETUP CSR NUMBER
3268            017202  113737  002422  113642    MOVB    SIDE,MSGB34       ;SETUP SIDE (0 OR 1)
3269            017210                            TYPE    MSG034
```

```
        017210  104401  113571                  TYPEIT  ,MSG034
                                                 .DSABL  CRF
3270    017214                                         END ;OF IF SUCCESS
        017214                                                                  L224:;;;;;;
3271    017214                                     END ;OF FOR SIDE
        017214  005237  002422                                                 INC SIDE
        017220  023727  002422  000061                                         CMP SIDE,#'1
        017226  003646                                                         BLE B30
        017230                                                                  E30:;;;;;;;
3272    017230                                   END ;OF IFB CSRINDEX
        017230                                                                  L217:;;;;;;
3273    017230  000241                           CLC
3274    017232  106037  002416                   RORB  CSRINDEX          ;CHANGE TO NEXT CONTROLLER
3275    017236  106337  002417                   ASLB  CSROUDEX          ;CHANGE TO NEXT CONTROLLER
3276    017242                                 END ;OF FOR CSRLOOP
        017242  005237  002420                                                 INC CSRLOOP
        017246  023727  002420  000067                                         CMP CSRLOOP,#'7
        017254  003622                                                         BLE B27
        017256                                                                  E27:;;;;;;;
3277    017256  104472                         ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
3278    017260                                 SET     CONTFLAG
        017260  012737  177777  002332                                        MOV  #-1,CONTFLAG
3279    017266                                 POP     BANK
        017266  012637  002106                                                 MOV (SP)+,BANK
3280    017272  004737  042422                 CALL    EXBANK
3281    017276  000207                         RETURN
```

```
3284 017300                            ISECCON:SUBTST  <<IS ECC ON?>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       IS ECC ON?
                                       ;*****************************************************************************
3285                                           ;SETUP CSR NUMBER
3286 017300  005000                            CLR     R0                      ;START A ZERO
3287 017302  113702  002417                     MOVB    CSROUDEX,R2             ;GET CSR INDEX #2
3288 017306  106002                    1$:     RORB    R2                      ;GET CSR BIT IN CARRY (MAYBE)
3289 017310  103403                            BCS     2$                      ;I GOT IT - SKIP
3290 017312  062700  000004                    ADD     #4,R0                   ;BUMP CSR ADDRESS LSB'S BY 4
3291 017316  000773                            BR      1$                      ;LOOP TILL I FIND THE CSR
3292 017320  010037  002256            2$:     MOV     R0,CSRNO                ;UPDATE CSR NUMBER
3293 017324  104503                            CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3294 017326  104426                            READCSR
3295 017330                                    IF #BIT1 SET.IN CSR
     017330  032737  000002  002144                                                    BIT #BIT1,CSR
     017336  001413                                                                   BEQ L225
3296 017340                                      TYPE  MSG078                  ;WARNING!  ECC IS DISABLED ON BOX
     017340  104401  115430                    TYPEIT  ,MSG078
                                               .DSABL  CRF
3297 017344  113737  002420  112134              MOVB  CSRLOOP,MSG015
3298 017352                                      TYPE  MSG015
     017352  104401  112134                    TYPEIT  ,MSG015
                                               .DSABL  CRF
3299 017356                                      SET   NOECCFLAG
     017356  012737  177777  002474                                                    MOV  #-1,NOECCFLAG
3300 017364                                    ELSE
     017364  000402                                                                   BR L226
     017366                                                                  L225:;;;;;;
3301 017366  005037  002474                      CLR   NOECCFLAG
3302 017372                                    END ;OF IF #BIT1
     017372                                                                  L226:;;;;;;
3303 017372  000207                            RETURN
```

```
 3306 017374                        SBETEST:SUBTST  <<CHECK FOR SBE FREE LOCATIONS>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       CHECK FOR SBE FREE LOCATIONS
                                    ;*****************************************************************************
 3307                                       ;IN ORDER TO DETERMINE IF A LOCATION IS SBE FREE I DO THIS
 3308                                       ;
 3309                                       ;WRITE ZEROS WITH ECC DISABLE
 3310                                       ;READ ZEROS BACK
 3311                                       ;IF NOT ZEROS THEN RETURN ERROR
 3312                                       ;
 3313                                       ;WRITE ZEROS WITH ECC ENABLED BUT TRAPS DISABLED
 3314                                       ;READ ZEROS BACK
 3315                                       ;IF NOT ZEROS THEN RETURN ERROR
 3316                                       ;
 3317                                       ;TEST THE LOCATION FROM THE PAR'S (WITH NO PROGRAM FETCHES)
 3318                                       ;IF THERE WERE ANY SBE'S OR DBE'S THEN RETURN ERROR
 3319                                       ;
 3320                                       ;COMPLIMENT ZEROS TO ONES WITH ECC DISABLE
 3321                                       ;READ ONES BACK
 3322                                       ;IF NOT ONES THEN RETURN ERROR
 3323                                       ;
 3324                                       ;WRITE 100,,100000,00000 (CHECKBITS COMPLIMENT OF BEFORE)
 3325                                       ;  WITH ECC ENABLED BUT TRAPS DISABLED
 3326                                       ;TEST THE LOCATION FROM THE PAR'S (WITH NO PROGRAM FETCHES)
 3327                                       ;IF THERE WERE ANY SBE'S OR DBE'S THEN RETURN ERROR
 3328                                       ;
 3329                                       ;IF NONE OF THE ABOVE FORCES A RETURN ERROR THEN RETURN NO.ERROR
 3330                                       .ENABL  LSB
 3331 017374  013701  002506                MOV     TESTADD,R1
 3332 017400                                SUPERVISOR              ;ENTER SUPERVISOR MODE
      017400  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT!
                                           .DSABL  CRF
 3333 017406  104424                        CACHOFF                 ;TURN CACHE OFF
 3334 017410  104471                        ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 3335 017412                                CLEAR   (R1),2(R1)
      017412  005011                                                                    CLR  (R1)
      017414  005061  000002                                                            CLR  2(R1)
 3336 017420  005711                        TST     (R1)
 3337 017422  001061                        BNE     1$
 3338 017424  005761  000002                TST     2(R1)
 3339 017430  001056                        BNE     1$
 3340
 3341 017432  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 3342 017434                                CLEAR   (R1),2(R1)
      017434  005011                                                                    CLR  (R1)
      017436  005061  000002                                                            CLR  2(R1)
 3343 017442  005711                        TST     (R1)
 3344 017444  001050                        BNE     1$
 3345 017446  005761  000002                TST     2(R1)
 3346 017452  001045                        BNE     1$
 3347
 3348 017454  104510                        TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 3349 017456                                IF #BIT15!BIT4 SET.IN CSR THEN GOTO 1$
      017456  032737  100020  002144                                                  BIT #BIT15!BIT4,CSR
      017464  001040                                                                  BNE 1$
 3350
 3351 017466  104471                        ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
```

```
3352 017470  005111                    COM     (R1)
3353 017472  005161  000002             COM     2(R1)
3354 017476  023711  002726             CMP     ONES,(R1)
3355 017502  001031                    BNE     1$
3356 017504  023761  002726  000002     CMP     ONES,2(R1)
3357 017512  001025                    BNE     1$
3358
3359 017514  104503                    CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3360 017516  005011                    CLR     (R1)
3361 017520  012761  100000  000002     MOV     #BIT15,2(R1)
3362 017526  005711                    TST     (R1)
3363 017530  001016                    BNE     1$
3364 017532  022761  100000  000002     CMP     #BIT15,2(R1)
3365 017540  001012                    BNE     1$
3366
3367 017542  104510                    TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
3368 017544                            IF #BIT15!BIT4 SET.IN CSR THEN GOTO 1$
     017544  032737  100020  002144                                        BIT #BIT15!BIT4,CSR
     017552  001005                                                        BNE 1$
3369
3370 017554  104417                    KERNEL                  ;ENTER KERNEL MODE
3371 017556  104473                    ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
3372 017560  104423                    CACHON                  ;TURN CACHE ON
3373 017562                            $RETURN NOERROR
     017562  000241                                                        CLC
     017564  000207                                                        RTS PC
3374
3375 017566  104503            1$:    CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3376 017570                            CLEAR   (R1),2(R1)
     017570  005011                                                        CLR  (R1)
     017572  005061  000002                                                CLR  2(R1)
3377 017576  104417                    KERNEL                  ;ENTER KERNEL MODE
3378 017600  104473                    ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
3379 017602  104423                    CACHON                  ;TURN CACHE ON
3380 017604                            $RETURN ERROR
     017604  000261                                                        SEC
     017606  000207                                                        RTS PC
3381                                   .DSABL  LSB
```

```
3384 017610                             INTKRAP:SUBTST  <<SETUP INTERLEAVE INFO>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SETUP INTERLEAVE INFO
                                        ;*****************************************************************************
3385                                            ;BASED ON THE STARTING ADDRESS, BOX CAPACITY, INTERLEAVE, AND SIDE
3386                                            ;SETUP VARIABLES TO DETERMINE
3387                                            ;(1)    THE STARTING ADDRESS OF THIS CONTROLLER
3388                                            ;(2)    THE NUMBER TO ADD TO EACH ADDRESS TO STAY IN THIS CONTROLLER
3389                                            ;(3)    THE LAST ADDRESS OF THIS CONTROLLER
3390 017610                                    PUSH    R0
     017610  010046                                                                         MOV R0,-(SP)
3391 017612  004737  017736                    CALL    GETSIZE
3392 017616  013737  002260  002410            MOV     FIRSTB,CSRFBANK
3393 017624  013737  002262  002412            MOV     LASTB,CSRLBANK
3394 017632  005037  002432                    CLR     SPECIAL
3395 017636  104426                           READCSR                 ;READ CSR
3396 017640  013700  002146                    MOV     CSR+2,R0
3397 017644  072027  177765                    ASH     #-11.,R0
3398 017650  042700  177760                    BIC     #^C17,R0        ;R0   (0..17) = BITS 14,13,12,11 OF CSR+2
3399 017654                                    CASE R0                 ;IF R0 = 0 CALL NEXT; IF R0 = 1 CALL NEXT+2, ETC.
     017654  010046                                                                         MOV R0,-(SP)
     017656  006316                                                                         ASL @SP
     017660  004737  017724                                                               JSR PC,..227
3400 017664  020234                              INT..0
3401 017666  020260                              INT..1
3402 017670  020324                              INT..2
3403 017672  020350                              INT..3
3404 017674  020414                              INT..4
3405 017676  020440                              INT..5
3406 017700  020504                              INT..6
3407 017702  020530                              INT..7
3408 017704  020574                              INT.10
3409 017706  020574                              INT.11
3410 017710  020616                              INT.12
3411 017712  020642                              INT.13
3412 017714  020706                              INT.14
3413 017716  020732                              INT.15
3414 017720  020776                              INT.16
3415 017722  021022                              INT.17
3416 017724                                    END                     ;OF CASE
     017724                                                                  L227::::::
     017724  062616                                                                       ADD (SP)+,@SP
     017726  013646                                                                       MOV @(SP)+,-(SP)
     017730  004736                                                                       JSR PC,@(SP)+
3417 017732                                    POP     R0
     017732  012600                                                                       MOV (SP)+,R0
3418 017734  000207                           RETURN
```

```
3421 017736                          GETSIZE:SUBTST  <<SUBR  GET SIZE FROM CSR>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        SUBR    GET SIZE FROM CSR
                                     ;*****************************************************************************
3422                                         ;SETUP FIRSTB AND LASTB
3423 017736                                  PUSH    R0
     017736  010046                                                              MOV R0,-(SP)
3424 017740  052737  000010  002144         BIS     #BIT3,CSR                   ;GET SET TO READ CSR
3425 017746  042737  000006  002144         BIC     #BIT2!BIT1,CSR
3426 017754  104425                         LOADCSR
3427 017756  104426                         READCSR
3428 017760  042737  000010  002144         BIC     #BIT3,CSR                   ;RESTORE THIS FROM ''SIZE'' MODE
3429 017766  113700  002145                 MOVB    CSR+1,R0                    ;GET SIZE
3430 017772  006300                         ASL     R0                          ;R0 = # OF BANKS
3431 017774  110037  002262                 MOVB    R0,LASTB
3432 020000  013700  002146                 MOV     CSR+2,R0
3433                                         ;CORRECT LAST BANK FOR EXTERNAL INTERLEAVE
3434 020004                                  IF #BIT12 SET.IN R0 THEN LET LASTB := LASTB L.SHIFT 1
     020004  032700  010000                                                      BIT #BIT12,R0
     020010  001402                                                             BEQ L230
     020012  006337  002262                                                     ASL LASTB
     020016                                                                  L230:::::::
3435 020016                                  IF #BIT13 SET.IN R0 THEN LET LASTB := LASTB L.SHIFT 1
     020016  032700  020000                                                      BIT #BIT13,R0
     020022  001402                                                             BEQ L231
     020024  006337  002262                                                     ASL LASTB
     020030                                                                  L231:::::::
3436 020030  042700  177000                 BIC     #177000,R0
3437 020034  006300                         ASL     R0
3438 020036  010037  002260                 MOV     R0,FIRSTB
3439 020042  063737  002260  002262         ADD     FIRSTB,LASTB
3440 020050  005337  002262                 DEC     LASTB
3441 020054                                  IF FIRSTB HI #167 THEN LET FIRSTB := #170
     020054  023727  002260  000167                                              CMP FIRSTB,#167
     020062  101403                                                             BLOS L232
     020064  012737  000170  002260                                             MOV #170,FIRSTB
     020072                                                                  L232:::::::
3442 020072                                  IF LASTB HI #167 THEN LET LASTB := #167
     020072  023727  002262  000167                                              CMP LASTB,#167
     020100  101403                                                             BLOS L233
     020102  012737  000167  002262                                             MOV #167,LASTB
     020110                                                                  L233:::::::
3443 020110                                  POP     R0
     020110  012600                                                             MOV (SP)+,R0
3444 020112  000207                         RETURN
```

```
 3448 020114                            CSRCASE:SUBTST  <<CSR PATTERN CASE STATEMENT>>
                                        ;*********************************************************************
                                        ;*SUBTEST       CSR PATTERN CASE STATEMENT
                                        ;*********************************************************************
 3449 020114                                    CASE R0
      020114  010046                                                                    MOV R0,-(SP)
      020116  006316                                                                    ASL @SP
      020120  004737  020224                                                            JSR PC,L234
 3450                                             ;WARNING IF YOU CHANGE THIS TABLE ALSO
 3451                                             ;CHANGE '$DDW0' - '$DDW5' (THE PATTERN BIT MAP)
 3452
 3453                                             ;PAT  TIME             DISCRIPTION
 3454 020124  022360                    MKCSRT:   MT0006          ;<1 SEC          INITIAL DATA TEST
 3455 020126  022456                              MT0010          ;<1 SEC          BYTE ADDRESSING TEST
 3456 020130  024172                              MT0025          ;<1 SEC          INTERRUPT ENABLE TEST
 3457 020132  022512                              MT0011          ;<2 SEC          CREATE SINGLE BIT ERROR TEST
 3458 020134  022570                              MT0012          ;<1 SEC          WRITE BYTE CLEARS SBE TEST
 3459 020136  022646                              MT0013          ; 1 SEC          CREATE DOUBLE BIT ERROR TEST
 3460 020140  022722                              MT0014          ; 1 SEC          WRITE INHIBIT DURING DATIP WITH DBE
 3461 020142  023000                              MT0015          ; 1 SEC          WRITE INHIBIT OF BYTE WITH DBE
 3462 020144  023056                              MT0016          ;<1 SEC          WRITE INHIBIT OF WORD WITH DBE
 3463 020146  025772                              MT0999          ; 0 SEC          NULL TEST
 3464 020150  025772                              MT0999          ; 0 SEC          NULL TEST
 3465 020152  025772                              MT0999          ; 0 SEC          NULL TEST
 3466 020154  025772                              MT0999          ; 0 SEC          NULL TEST
 3467 020156  025772                              MT0999          ; 0 SEC          NULL TEST
 3468 020160  025772                              MT0999          ; 0 SEC          NULL TEST
 3469 020162  025772                              MT0999          ; 0 SEC          NULL TEST
 3470 020164  025772                              MT0999          ; 0 SEC          NULL TEST
 3471 020166  025772                              MT0999          ; 0 SEC          NULL TEST
 3472 020170  025772                              MT0999          ; 0 SEC          NULL TEST
 3473 020172  025772                              MT0999          ; 0 SEC          NULL TEST
 3474 020174  025772                              MT0999          ; 0 SEC          NULL TEST
 3475 020176  025772                              MT0999          ; 0 SEC          NULL TEST
 3476 020200  025772                              MT0999          ; 0 SEC          NULL TEST
 3477 020202  025772                              MT0999          ; 0 SEC          NULL TEST
 3478 020204  025772                              MT0999          ; 0 SEC          NULL TEST
 3479 020206  025772                              MT0999          ; 0 SEC          NULL TEST
 3480 020210  025772                              MT0999          ; 0 SEC          NULL TEST
 3481 020212  025772                              MT0999          ; 0 SEC          NULL TEST
 3482 020214  025772                              MT0999          ; 0 SEC          NULL TEST
 3483 020216  025772                              MT0999          ; 0 SEC          NULL TEST
 3484 020220  025772                              MT0999          ; 0 SEC          NULL TEST
 3485 020222  025772                              MT0999          ; 0 SEC          NULL TEST
 3486 020224                                    END ;OF CASE R0
      020224                                                            L234:::::::
      020224  062616                                                              ADD (SP)+,@SP
      020226  013646                                                              MOV @(SP)+,-(SP)
      020230  004736                                                              JSR PC,@(SP)+
 3487 020232  000207                            RETURN
```

```
3490 020234                                     SUBTST  <<DETERMINE ADDRESSING ACCORDING TO INTERLEAVE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       DETERMINE ADDRESSING ACCORDING TO INTERLEAVE
                                        ;*****************************************************************************
3491                                            ;CSRFBANK := THE FIRST BANK OF THIS CONTROLLER OF THIS CSR
3492                                            ;CSRLBANK := THE LAST BANK OF THIS CONTROLLER OF THIS CSR
3493                                            ;CSRFIRST := THE FIRST ADDRESS OF THIS CONTROLLER OF THIS CSR
3494                                            ;CSRINC := THE NUMBER TO ADD TO THE ADDRESS PAIR
3495                                            ;       TO RETURN TO THIS CONTROLLER OF THIS CSR
3496                                            ;SPECIAL := A FLAG SET IF THIS BOX IS NOT INTERNALLY INTERLEAVED
3497
3498                                            ;NO INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE
3499 020234                                INT..0: LET CSRFIRST := #FIRST
     020234  012737  060000  002336                                                    MOV #FIRST,CSRFIRST
3500 020242                                     SET     SPECIAL
     020242  012737  177777  002432                                                    MOV  #-1,SPECIAL
3501 020250                                     LET CSRINC := #4
     020250  012737  000004  002414                                                    MOV #4,CSRINC
3502 020256  000207                             RETURN
3503
3504                                            ;INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE
3505 020260                                INT..1: LET CSRFBANK := FIRSTB
     020260  013737  002260  002410                                                    MOV FIRSTB,CSRFBANK
3506 020266                                     IFB SIDE EQ #'0
     020266  123727  002422  000060                                                    CMPB SIDE,#'0
     020274  001004                                                                   BNE L235
3507 020276                                       LET CSRFIRST := #FIRST
     020276  012737  060000  002336                                                    MOV #FIRST,CSRFIRST
3508 020304                                     ELSE
     020304  000403                                                                   BR L236
     020306                                                                  L235:;;;;;;
3509 020306                                       LET CSRFIRST := #FIRST+4
     020306  012737  060004  002336                                                    MOV #FIRST+4,CSRFIRST
3510 020314                                     END ;OF IFB
     020314                                                                  L236:;;;;;;
3511 020314                                     LET CSRINC := #10
     020314  012737  000010  002414                                                    MOV #10,CSRINC
3512 020322  000207                             RETURN
3513
3514                                            ;NO INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH EVEN DOUBLE WORDS SELECTED?)
3515 020324                                INT..2: LET CSRFIRST := #FIRST
     020324  012737  060000  002336                                                    MOV #FIRST,CSRFIRST
3516 020332                                     SET     SPECIAL
     020332  012737  177777  002432                                                    MOV  #-1,SPECIAL
3517 020340                                     LET CSRINC := #10
     020340  012737  000010  002414                                                    MOV #10,CSRINC
3518 020346  000207                             RETURN
3519
3520                                            ;INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH EVEN DOUBLE WORDS SELECTED?)
3521 020350                                INT..3: LET CSRFBANK := FIRSTB
     020350  013737  002260  002410                                                    MOV FIRSTB,CSRFBANK
3522 020356                                     IFB SIDE EQ #'0
     020356  123727  002422  000060                                                    CMPB SIDE,#'0
     020364  001004                                                                   BNE L237
3523 020366                                       LET CSRFIRST := #FIRST
     020366  012737  060000  002336                                                    MOV #FIRST,CSRFIRST
3524 020374                                     ELSE
```

```
        020374  000403                                                          BR L240
        020376                                                          L237:;;;;;;
  3525  020376                        LET CSRFIRST := #FIRST+10
        020376  012737  060010  002336                                          MOV #FIRST+10,CSRFIRST
  3526  020404                    END ;OF IFB
        020404                                                          L240:;;;;;;
  3527  020404                    LET CSRINC := #20
        020404  012737  000020  002414                                          MOV #20,CSRINC
  3528  020412  000207            RETURN
  3529
  3530                            ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=0)
  3531  020414                INT..4: LET CSRFIRST := #FIRST
        020414  012737  060000  002336                                          MOV #FIRST,CSRFIRST
  3532  020422                    SET     SPECIAL
        020422  012737  177777  002432                                          MOV  #-1,SPECIAL
  3533  020430                    LET CSRINC := #20
        020430  012737  000020  002414                                          MOV #20,CSRINC
  3534  020436  000207            RETURN
  3535
  3536                            ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=0)
  3537  020440                INT..5: LET CSRFBANK := FIRSTB
        020440  013737  002260  002410                                          MOV FIRSTB,CSRFBANK
  3538  020446                    IFB SIDE EQ #'0
        020446  123727  002422  000060                                          CMPB SIDE,#'0
        020454  001004                                                         BNE L241
  3539  020456                      LET CSRFIRST := #FIRST
        020456  012737  060000  002336                                          MOV #FIRST,CSRFIRST
  3540  020464                    ELSE
        020464  000403                                                         BR L242
        020466                                                          L241:;;;;;;
  3541  020466                      LET CSRFIRST := #FIRST+20
        020466  012737  060020  002336                                          MOV #FIRST+20,CSRFIRST
  3542  020474                    END ;OF IFB
        020474                                                          L242:;;;;;;
  3543  020474                    LET CSRINC := #40
        020474  012737  000040  002414                                          MOV #40,CSRINC
  3544  020502  000207            RETURN
  3545
  3546                            ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02=0)
  3547  020504                INT..6: LET CSRFIRST := #FIRST+10
        020504  012737  060010  002336                                          MOV #FIRST+10,CSRFIRST
  3548  020512                    SET     SPECIAL
        020512  012737  177777  002432                                          MOV  #-1,SPECIAL
  3549  020520                    LET CSRINC := #20
        020520  012737  000020  002414                                          MOV #20,CSRINC
  3550  020526  000207            RETURN
  3551
  3552                            ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02=0)
  3553  020530                INT..7: LET CSRFBANK := FIRSTB
        020530  013737  002260  002410                                          MOV FIRSTB,CSRFBANK
  3554  020536                    IFB SIDE EQ #'0
        020536  123727  002422  000060                                          CMPB SIDE,#'0
        020544  001004                                                         BNE L243
  3555  020546                      LET CSRFIRST := #FIRST+10
        020546  012737  060010  002336                                          MOV #FIRST+10,CSRFIRST
  3556  020554                    ELSE
        020554  000403                                                         BR L244
```

```
                020556                                                                  L243:::::::
3557            020556                          LET CSRFIRST := #FIRST+30
                020556  012737  060030  002336                                          MOV #FIRST+30,CSRFIRST
3558            020564                      END ;OF IFB
                020564                                                                  L244:::::::
3559            020564                      LET CSRINC := #40
                020564  012737  000040  002414                                          MOV #40,CSRINC
3560            020572  000207              RETURN
3561
3562                                        ;IMPOSSIBLE CONDITION
3563                                        ;NO INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3564            020574              INT.10: ;FALL THRU TO INT.11
3565
3566                                        ;IMPOSSIBLE CONDITION
3567                                        ;INTERNAL INTERLEAVE, NO EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3568            020574              INT.11: IF FSINFLAG IS FALSE
                020574  005737  002542                                                  TST FSINFLAG
                020600  001005                                                          BNE L245
3569            020602                        SET   FSINFLAG
                020602  012737  177777  002542                                        MOV  #-1,FSINFLAG
3570            020610                      TYPE  MSG097
                020610  104401  116137      TYPEIT  ,MSG097
                                            .DSABL  CRF
3571            020614                      END ;OF IF FSINFLAG
                020614                                                                  L245:::::::
3572            020614                      GOTO    INT..1
                020614  000621                                                          BR INT..1
3573
3574                                        ;NO INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3575            020616              INT.12: LET CSRFIRST := #FIRST+4
                020616  012737  060004  002336                                          MOV #FIRST+4,CSRFIRST
3576            020624                      SET     SPECIAL
                020624  012737  177777  002432                                        MOV  #-1,SPECIAL
3577            020632                      LET CSRINC := #10
                020632  012737  000010  002414                                        MOV #10,CSRINC
3578            020640  000207              RETURN
3579
3580                                        ;INTERNAL INTERLEAVE, 2-1 EXTERNAL INTERLEAVE (WITH ODD DOUBLE WORDS SELECTED?)
3581            020642              INT.13: LET CSRFBANK := FIRSTB
                020642  013737  002260  002410                                        MOV FIRSTB,CSRFBANK
3582            020650                      IFB SIDE EQ #'0
                020650  123727  002422  000060                                        CMPB SIDE,#'0
                020656  001004                                                        BNE L246
3583            020660                        LET CSRFIRST := #FIRST+4
                020660  012737  060004  002336                                        MOV #FIRST+4,CSRFIRST
3584            020666                      ELSE
                020666  000403                                                        BR L247
                020670                                                              L246:::::::
3585            020670                        LET CSRFIRST := #FIRST+14
                020670  012737  060014  002336                                        MOV #FIRST+14,CSRFIRST
3586            020676                      END ;OF IFB
                020676                                                              L247:::::::
3587            020676                      LET CSRINC := #20
                020676  012737  000020  002414                                        MOV #20,CSRINC
3588            020704  000207              RETURN
3589
3590                                        ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=1)
```

```
3591 020706                          INT.14: LET CSRFIRST := #FIRST+4
     020706  012737  060004  002336                                    MOV #FIRST+4,CSRFIRST
3592 020714                                  SET     SPECIAL
     020714  012737  177777  002432                                    MOV  #-1,SPECIAL
3593 020722                                  LET CSRINC := #20
     020722  012737  000020  002414                                    MOV #20,CSRINC
3594 020730  000207                          RETURN
3595
3596                                         ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=0,A02=1)
3597 020732                          INT.15: LET CSRFBANK := FIRSTB
     020732  013737  002260  002410                                    MOV FIRSTB,CSRFBANK
3598 020740                                  IFB SIDE EQ #'0
     020740  123727  002422  000060                                    CMPB SIDE,#'0
     020746  001004                                                    BNE L250
3599 020750                                    LET CSRFIRST := #FIRST+4
     020750  012737  060004  002336                                    MOV #FIRST+4,CSRFIRST
3600 020756                                  ELSE
     020756  000403                                                    BR L251
     020760                                                      L250:::::::
3601 020760                                    LET CSRFIRS  .  #FIRST+24
     020760  012737  060024  002336                                    MOV #FIRST+24,CSRFIRST
3602 020766                                  END ;OF IFB
     020766                                                      L251:::::::
3603 020766                                  LET CSRINC :- #40
     020766  012737  000040  002414                                    MOV #40,CSRINC
3604 020774  000207                          RETURN
3605
3606                                         ;NO INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02-1)
3607 020776                          INT.16: LET CSRFIRST :- #FIRST+14
     020776  012737  060014  002336                                    MOV #FIRST+14,CSRFIRST
3608 021004                                  SET     SPECIAL
     021004  012737  177777  002432                                    MOV  #-1,SPECIAL
3609 021012                                  LET CSRINC :- #20
     021012  012737  000020  002414                                    MOV #20,CSRINC
3610 021020  000207                          RETURN
3611
3612                                         ;INTERNAL INTERLEAVE, 4-1 EXTERNAL INTERLEAVE (WITH A03=1,A02-1)
3613 021022                          INT.17: LET CSRFBANK := FIRSTB
     021022  013737  002260  002410                                    MOV FIRSTB,CSRFBANK
3614 021030                                  IFB SIDE EQ #'0
     021030  123727  002422  000060                                    CMPB SIDE,#'0
     021036  001004                                                    BNE L252
3615 021040                                    LET CSRFIRST := #FIRST+14
     021040  012737  060014  002336                                    MOV #FIRST+14,CSRFIRST
3616 021046                                  ELSE
     021046  000403                                                    BR L253
     021050                                                      L252:::::::
3617 021050                                    LET CSRFIRST := #FIRST+34
     021050  012737  060034  002336                                    MOV #FIRST+34,CSRFIRST
3618 021056                                  END ;OF IFB
     021056                                                      L253:::::::
3619 021056                                  LET CSRINC :  #40
     021056  012737  000040  002414                                    MOV #40,CSRINC
3620 021064  000207                          RETURN
3621
```

```
3624 021066                          SIDEOK: SUBTST  <<DETERMINE IF BANK BELONGS TO CORRECT SIDE>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       DETERMINE IF BANK BELONGS TO CORRECT SIDE
                                     ;*****************************************************************************
3625                                         ;RETURN ERROR IF NOT!
3626
3627 021066  005037  002404                 CLR     CHECK
3628 021072  013702  002336                 MOV     CSRFIRST,R2
3629 021076  104475                         CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
3630 021100                                 SUPERVISOR              ;ENTER SUPERVISOR MODE
     021100  052737  040000  177776         BIS     #BIT14,PSW              ;DO IT TO IT
                                         .DSABL  CRF
3631 021106  104424                         CACHOFF                 ;TURN CACHE OFF
3632 021110  012722  000000                 MOV     #0,(R2)+
3633 021114  012712  000000                 MOV     #0,(R2)
3634 021120  104503                         CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3635 021122  005712                         TST     (R2)
3636 021124  104426                         READCSR
3637 021126  013701  002146                 MOV     CSR+2,R1
3638
3639                                         ;ELIMINATE DBE
3640 021132  104471                         ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
3641 021134  013712  002430                 MOV     ZEROS,(R2)
3642 021140  013742  002430                 MOV     ZEROS,-(R2)
3643 021144  104503                         CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
3644 021146  104417                         KERNEL                  ;ENTER KERNEL MODE
3645 021150  104423                         CACHON                  ;TURN CACHE ON
3646
3647 021152                                 IF #BIT9 OFF.IN R1 AND SIDE EQ #'0 THEN $RETURN NOERROR
     021152  032701  001000                                                     BIT #BIT9,R1
     021156  001006                                                     BNE L254
     021160  023727  002422  000060                                             CMP SIDE,#'0
     021166  001002                                                     BNE L254
     021170  000241                                                     CLC
     021172  000207                                                     RTS PC
     021174                                                         L254:::::::
3648 021174                                 IF #BIT9 SET.IN R1 AND SIDE EQ #'1 THEN $RETURN NOERROR
     021174  032701  001000                                                     BIT #BIT9,R1
     021200  001406                                                     BEQ L255
     021202  023727  002422  000061                                             CMP SIDE,#'1
     021210  001002                                                     BNE L255
     021212  000241                                                     CLC
     021214  000207                                                     RTS PC
     021216                                                         L255:::::::
3649 021216                                 $RETURN ERROR
     021216  000261                                                     SEC
     021220  000207                                                     RTS PC
```

```
3653 021222                            MKTEST: SUBTST  <<SUBR  MK11 TEST DISPATCH>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SUBR    MK11 TEST DISPATCH
                                       ;*****************************************************************************
3654 021222                                    IF MULTIONLY IS TRUE THEN $RETURN
     021222  005737  002004                                                        TST MULTIONLY
     021226  001401                                                                BEQ L256
     021230  000207                                                                RTS PC
     021232                                                                L256:::::::
3655 021232                                    IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
     021232  032777  000001  161526                                                BIT #SW0,@SWR
     021240  001003                                                                BNE L257
     021242  005737  002442                                                        TST ACTFLAG
     021246  001402                                                                BEQ L260
     021250                                                                L257:::::::
3656 021250  104470                        ECCDIS                    ;DISABLE ERROR CORRECTION
3657 021252                                ELSE
     021252  000401                                                                BR L261
     021254                                                                L260:::::::
3658 021254  104502                        CLRCSR                    ;CLEAR MK11 CSRS
3659 021256                                END ;OF IF
     021256                                                                L261:::::::
3660 021256  012737  000002  002100        MOV     #2,NOPAR          ;INDICATE PARITY ACTION
3661 021264  012737  000002  002406        MOV     #2,PCBUMP         ;TRAPS ADD 2 TO PC
3662 021272  013700  002120                MOV     PATTERN,R0        ;GET PATTERN NUMBER
3663 021276  006300                        ASL     R0                ;MAKE IT A WORD ADDRESS
3664 021300                                IF MKPAT(R0) NE #MT0035 AND MKPAT(R0) NE #MT0999
     021300  026027  021402  025652                                                CMP MKPAT(R0),#MT0035
     021306  001405                                                                BEQ L262
     021310  026027  021402  025772                                                CMP MKPAT(R0),#MT0999
     021316  001401                                                                BEQ L262
3665 021320  104511                          INVALIDATE            ;INVALIDATE BACKGROUND PATTERN ON 'BANK'
3666 021322                                END ;OF IF MKPAT(R0)
     021322                                                                L262:::::::
3667 021322  004770  021402                CALL    @MKPAT(R0)        ;INDEX OFF TABLE
3668 021326                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
     021326  032777  000001  161432                                                BIT #SW0,@SWR
     021334  001003                                                                BNE L263
     021336  005737  002442                                                        TST ACTFLAG
     021342  001413                                                                BEQ L264
     021344                                                                L263:::::::
3669 021344  104476                          WASSBE                    ;WAS THERE ANY SINGLE BIT ERRORS
3670 021346                                  ON.ERROR
     021346  103011                                                                BCC L265
3671 021350                                    SET SBEFLAG
     021350  012737  177777  002022                                                MOV  #-1,SBEFLAG
3672 021356  013737  002144  002150            MOV CSR,SBECSR
3673 021364  013737  002146  002152            MOV CSR+2,SBECSR+2
3674 021372                                  END ;OF ON.ERROR
     021372                                                                L265:::::::
3675 021372                                END ;OF IF #SW0
     021372                                                                L264:::::::
3676 021372  104472                        ECCINIT           ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
3677 021374  005037  002100                CLR     NOPAR             ;INDICATE PARITY ACTION
3678 021400  000207                        RETURN
3679
3680                                       ;WARNING IF YOU CHANGE THIS TABLE ALSO
```

```
3681                                    ;CHANGE '$DDW0' - '$DDW5' (THE PATTERN BIT MAP)
3682
3683                                    ;PAT    TIME            DISCRIPTION
3684 021402                     MKPAT:  ;NOTE MT0035 MUST BE FIRST & LAST
3685 021402  025652                    MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
3686 021404  023134                    MT0017  ;<1 SEC         ;HOLDING 1'S & 0'S TEST
3687 021406  022414                    MT0007  ;<1 SEC         ;ADDRESS BIT TEST
3688 021410  021740                    MT0001  ;<1 SEC         ;ADDRESS TEST
3689 021412  022000                    MT0002  ;<1 SEC         ;COMPLEMENT ADDRESS TEST
3690 021414  022216                    MT0004  ; 1 SEC         ;ROTATING ZEROS TEST
3691 021416  022300                    MT0005  ; 1 SEC         ;ROTATING ONES TEST
3692 021420  023612                    MT0021  ; 1 SEC         ;MARCHING 0'S & 1'S TEST
3693 021422  023156                    MT0020  ;<1 SEC         ;MARCHING 1'S & 0'S IN CHECK BITS
3694 021424  023734                    MT0022  ;10 SEC         ;REFRESH & SHIFTING DIAGONAL  TEST
3695 021426  024240                    MT0026  ;<1 SEC         ;RANDOM DATA TEST
3696 021430  024032                    MT0024  ;20 SEC         ;FAST GALLOPING PATTERN TEST
3697 021432  025214                    MT0031  ; 3 SEC         ;SOB-A-LONG TEST
3698 021434  025340                    MT0033  ;<1 SEC         ;WRITE RECOVERY TEST
3699 021436  025530                    MT0034  ;35 SEC         ;BRANCH GOBBLE TEST
3700 021440  025652                    MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
3701                                    ;NOTE MT0035 MUST BE FIRST & LAST
3702 021442  025772                    MT0999  ; 0 SEC         ;NULL TEST
3703 021444  025772                    MT0999  ; 0 SEC         ;NULL TEST
3704 021446  025772                    MT0999  ; 0 SEC         ;NULL TEST
3705 021450  025772                    MT0999  ; 0 SEC         ;NULL TEST
3706 021452  025772                    MT0999  ; 0 SEC         ;NULL TEST
3707 021454  025772                    MT0999  ; 0 SEC         ;NULL TEST
3708 021456  025772                    MT0999  ; 0 SEC         ;NULL TEST
3709 021460  025772                    MT0999  ; 0 SEC         ;NULL TEST
3710 021462  025772                    MT0999  ; 0 SEC         ;NULL TEST
3711 021464  025772                    MT0999  ; 0 SEC         ;NULL TEST
3712 021466  025772                    MT0999  ; 0 SEC         ;NULL TEST
3713 021470  025772                    MT0999  ; 0 SEC         ;NULL TEST
3714 021472  025772                    MT0999  ; 0 SEC         ;NULL TEST
3715 021474  025772                    MT0999  ; 0 SEC         ;NULL TEST
3716 021476  025772                    MT0999  ; 0 SEC         ;NULL TEST
3717 021500  025772                    MT0999  ; 0 SEC         ;NULL TEST
3718 021502  025772                    MT0999  ; 0 SEC         ;NULL TEST
3719 021504  025772                    MT0999  ; 0 SEC         ;NULL TEST
3720 021506  025772                    MT0999  ; 0 SEC         ;NULL TEST
3721 021510  025772                    MT0999  ; 0 SEC         ;NULL TEST
```

```
3724 021512                            MJTEST: SUBTST  <<SUBR  MJ11 TEST DISPATCH>>
                                       ;*****************************************************************************
                                       ;*SUBTEST        SUBR    MJ11 TEST DISPATCH
                                       ;*****************************************************************************
3725 021512                                    IF MULTIONLY IS TRUE THEN $RETURN
     021512  005737  002004                                                          TST MULTIONLY
     021516  001401                                                                  BEQ L266
     021520  000207                                                                  RTS PC
     021522                                                                 L266:::::::
3726 021522  012737  000002  002100          MOV     #2,NOPAR                ;INDICATE PARITY ACTION
3727 021530  012737  000002  002406          MOV     #2,PCBUMP               ;TRAPS ADD 2 TO PC
3728 021536  013700  002120                  MOV     PATTERN,R0              ;GET PATTERN NUMBER
3729 021542  006300                          ASL     R0                      ;MAKE IT A WORD ADDRESS
3730 021544                                    IF MJPAT(R0) NE #MT0035 AND MJPAT(R0) NE #MT0999
     021544  026027  021600  025652                                                  CMP MJPAT(R0),#MT0035
     021552  001405                                                                  BEQ L267
     021554  026027  021600  025772                                                  CMP MJPAT(R0),#MT0999
     021562  001401                                                                  BEQ L267
3731 021564  104511                            INVALIDATE              ;INVALIDATE BACKGROUND PATTERN ON "BANK"
3732 021566                                    END ;OF IF MJPAT(R0)
     021566                                                                 L267:::::::
3733 021566  004770  021600                  CALL    @MJPAT(R0)              ;INDEX OFF TABLE
3734 021572  005037  002100                  CLR     NOPAR                   ;INDICATE PARITY ACTION
3735 021576  000207                          RETURN
3736
3737                                   ;WARNING IF YOU CHANGE THIS TABLE ALSO
3738                                   ;CHANGE "$DDW0" - "$DDW5" (THE PATTERN BIT MAP)
3739
3740                                   ;PAT    TIME            DISCRIPTION
3741 021600                            MJPAT: ;NOTE MT0035 MUST BE FIRST & LAST
3742 021600  025652                          MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
3743 021602  023134                          MT0017  ;<1 SEC         ;HOLDING 1'S & 0'S TEST
3744 021604  022414                          MT0007  ;<1 SEC         ;ADDRESS BIT TEST
3745 021606  021740                          MT0001  ;<1 SEC         ;ADDRESS TEST
3746 021610  022000                          MT0002  ;<1 SEC         ;COMPLEMENT ADDRESS TEST
3747 021612  022050                          MT0003  ; 1 SEC         ;3 XOR 9 WORST CASE NOISE TEST
3748 021614  022216                          MT0004  ; 1 SEC         ;ROTATING ZEROS TEST
3749 021616  022300                          MT0005  ; 1 SEC         ;ROTATING ONES TEST
3750 021620  023612                          MT0021  ; 1 SEC         ;MARCHING 0'S & 1'S TEST
3751 021622  023766                          MT0023  ;10 SEC         ;SHIFTING DIAGONAL  TEST
3752 021624  024240                          MT0026  ;<1 SEC         ;RANDOM DATA TEST
3753 021626  024032                          MT0024  ;20 SEC         ;FAST GALLOPING PATTERN TEST
3754 021630  025214                          MT0031  ; 3 SEC         ;SOB-A-LONG TEST
3755 021632  025340                          MT0033  ;<1 SEC         ;WRITE RECOVERY TEST
3756 021634  025530                          MT0034  ;35 SEC         ;BRANCH GOBBLE TEST
3757 021636  025652                          MT0035  ;<1 SEC         ;SOFT ERROR - BACKGROUND PATTERN TEST
3758                                   ;NOTE MT0035 MUST BE FIRST & LAST
3759 021640  025772                          MT0999  ; 0 SEC         ;NULL TEST
3760 021642  025772                          MT0999  ; 0 SEC         ;NULL TEST
3761 021644  025772                          MT0999  ; 0 SEC         ;NULL TEST
3762 021646  025772                          MT0999  ; 0 SEC         ;NULL TEST
3763 021650  025772                          MT0999  ; 0 SEC         ;NULL TEST
3764 021652  025772                          MT0999  ; 0 SEC         ;NULL TEST
3765 021654  025772                          MT0999  ; 0 SEC         ;NULL TEST
3766 021656  025772                          MT0999  ; 0 SEC         ;NULL TEST
3767 021660  025772                          MT0999  ; 0 SEC         ;NULL TEST
3768 021662  025772                          MT0999  ; 0 SEC         ;NULL TEST
```

JBR MJ11 TEST DISPATCH

```
3769 021664  025772                    MT0999  ; 0 SEC         ;NULL TEST
3770 021666  025772                    MT0999  ; 0 SEC         ;NULL TEST
3771 021670  025772                    MT0999  ; 0 SEC         ;NULL TEST
3772 021672  025772                    MT0999  ; 0 SEC         ;NULL TEST
3773 021674  025772                    MT0999  ; 0 SEC         ;NULL TEST
3774 021676  025772                    MT0999  ; 0 SEC         ;NULL TEST
3775 021700  025772                    MT0999  ; 0 SEC         ;NULL TEST
3776 021702  025772                    MT0999  ; 0 SEC         ;NULL TEST
```

```
                                        .SBTTL  PATTERNS
                                        .SBTTL  MEMORY TEST SETUP ROUTINES
021704                          MT0000: SUBTST  <<MT0000        SETUP DATA PATTERN TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0000  SETUP DATA PATTERN TEST
                                ;*****************************************************************************
021704  005037  002366                  CLR     REALPAT         ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
021710  012700  060000                  MOV     #FIRST,R0
021714  012701  040000                  MOV     #SIZE,R1
021720  004737  035204                  CALL    REGCOPY
021724                                  BMOV    MTP000
021724  004537  043710                      JSR R5,BLOCK1
021730  026376                              MTP000
                                            .DSABL      CRF
021732  004737  026042                  CALL    SUPD01                  ;DO IT IN SUPERVISOR MODE
021736  000207                          RETURN
021740                          MT0001: SUBTST  <<MT0001        SETUP ADDRESS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0001  SETUP ADDRESS TEST
                                ;*****************************************************************************
021740  012737  000001  002366          MOV     #1,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
021746  012700  060000                  MOV     #FIRST,R0
021752  012701  040000                  MOV     #SIZE,R1
021756  005002                          CLR     R2
021760  004737  035204                  CALL    REGCOPY
021764                                  BMOV    MTP001
021764  004537  043710                      JSR R5,BLOCK1
021770  026422                              MTP001
                                            .DSABL      CRF
021772  004737  026042                  CALL    SUPD01                  ;DO IT IN SUPERVISOR MODE
021776  000207                          RETURN
022000                          MT0002: SUBTST  <<MT0002        SETUP COMPLEMENT ADDRESS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MT0002  SETUP COMPLEMENT ADDRESS TEST
                                ;*****************************************************************************
022000  012737  000002  002366          MOV     #2,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
022006  012700  160000                  MOV     #LAST+2,R0
022012  012701  040000                  MOV     #SIZE,R1
022016  012702  000001                  MOV     #1,R2
022022  010103                          MOV     R1,R3
022024  012704  060000                  MOV     #FIRST,R4
022030  012705  100001                  MOV     #100001,R5
022034                                  BMOV    MTP002
022034  004537  043710                      JSR R5,BLOCK1
022040  026454                              MTP002
                                            .DSABL      CRF
022042  004737  026042                  CALL    SUPD01
022046  000207                          RETURN
```

```
 3811 022050                                MT0003: SUBTST  <<MT0003        SETUP 3 XOR 9 WORST CASE NOISE TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MT0003  SETUP 3 XOR 9 WORST CASE NOISE TEST
                                            ;*****************************************************************************
 3812 022050  012737  000003  002366               MOV     #3,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3813 022056  005037  002406                       CLR     PCBUMP                  ;TRAPS DO NOT ADD TO PC
 3814 022062  004737  035214               1$:     CALL    FLIPWARN                ;SETUP WARNING CONSTANTS & R2
 3815 022066  012701  060000               2$:     MOV     #FIRST,R1               ;R1 <-- STARTING ADDRESS
 3816 022072  005000                               CLR     R0                      ;INTERLEAVE ADDRESS CONSTANT
 3817 022074  160001                               SUB     R0,R1                   ;CORRECT FOR ADD BEFORE USE MODE
 3818 022076  012703  020000                       MOV     #SIZE/2,R3              ;INTERLEAVE SIZE (8K,4K,2K,OR 1K (DOUBLE WORDS))
 3819 022102  072327  177770                       ASH     #-8.,R3                 ;R3 <-- R3 / 256.
 3820 022106  012702  000004                       MOV     #4,R2                   ;SMALL LOOP SIZE
 3821 022112  012705  000100                       MOV     #64.,R5                 ;MEDIUM LOOP SIZE
 3822 022116                                       BMOV    MTPA03,UDPDR7,17.
      022116  004537  043744                           JSR R5,BLOCK3
      022122  000021                                   17.
      022124  177636                                   UDPDR7
      022126  026506                                   MTPA03
                                                       .DSABL      CRF
 3823 022130  104415                               SAVREG
 3824 022132  012737  177636  002360               MOV     #FASTCITY-2,SUPDOADD
 3825 022140  004737  026220                       CALL    SUPD03
 3826 022144                                       BMOV    MTPB03
      022144  004537  043710                           JSR R5,BLOCK1
      022150  026550                                   MTPB03
                                                       .DSABL      CRF
 3827 022152                                       BMOV    MTPC03,KDPAR0,8.
      022152  004537  043744                           JSR R5,BLOCK3
      022156  000010                                   8.
      022160  172360                                   KDPAR0
      022162  026610                                   MTPC03
                                                       .DSABL      CRF
 3828 022164                                       BMOV    MTPD03,SDPAR0,8.
      022164  004537  043744                           JSR R5,BLOCK3
      022170  000010                                   8.
      022172  172260                                   SDPAR0
      022174  026630                                   MTPD03
                                                       .DSABL      CRF
 3829 022176  104416                               RESREG
 3830 022200  004737  026056                       CALL    SUPD02
 3831 022204  022737  000003  002734               CMP     #3,FLIPLOC              ;DONE WITH 4 PATTERNS
 3832                                                                               ;[(0,177777);(177777,0);(401,177777);(177777,401)]?
 3833 022212  001323                               BNE     1$                      ;NO - LOOP
 3834 022214  000207                               RETURN
 3835
 3836 022216                                MT0004: SUBTST  <<MT0004        SETUP ROTATING ZEROS TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MT0004  SETUP ROTATING ZEROS TEST
                                            ;*****************************************************************************
 3837 022216  012737  000004  002366               MOV     #4,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3838 022224  012737  000004  002406               MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 3839 022232  013702  002726                       MOV     ONES,R2
 3840 022236  004737  035344                       CALL    BACKGND                 ;WRITE BACKGROUND OF ONES
 3841 022242  012700  060000                       MOV     #FIRST,R0
 3842 022246  012701  040000                       MOV     #SIZE,R1
 3843 022252                                       BMOV    MTPA04
```

```
        022252  004537  043710                  JSR R5,BLOCK1
        022256  026650                          MTPA04
                                                .DSABL      CRF
   3844 022260                                  BMOV    MTPB04,KDPAR0,8.
        022260  004537  043744                  JSR R5,BLOCK3
        022264  000010                          8.
        022266  172360                          KDPAR0
       ,022270  026704                          MTPB04
                                                .DSABL      CRF
   3845 022272  004737  026056                  CALL    SUPD02
   3846 022276  000207                          RETURN
   3847 022300                          MT0005: SUBTST  <<MT0005        SETUP ROTATING ONES TEST>>
                                        ;*************************************************************************
                                        ;*SUBTEST       MT0005  SETUP ROTATING ONES TEST
                                        ;*************************************************************************
   3848 022300  012737  000005  002366          MOV     #5,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
   3849 022306  012737  000004  002406          MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
   3850 022314  005002                          CLR     R2
   3851 022316  004737  035344                  CALL    BACKGND                 ;WRITE BACKGROUND OF ZEROS
   3852 022322  012700  060000                  MOV     #FIRST,R0
   3853 022326  012701  040000                  MOV     #SIZE,R1
   3854 022332                                  BMOV    MTP005
        022332  004537  043710                  JSR R5,BLOCK1
        022336  026724                          MTP005
                                                .DSABL      CRF
   3855 022340                                  BMOV    MTPB04,KDPAR0,8.
        022340  004537  043744                  JSR R5,BLOCK3
        022344  000010                          8.
        022346  172360                          KDPAR0
        022350  026704                          MTPB04
                                                .DSABL      CRF
   3856 022352  004737  026056                  CALL    SUPD02
   3857 022356  000207                          RETURN
```

```
 3860 022360                                MT0006: SUBTST  <<MT0006        SETUP INITIAL DATA TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MT0006  SETUP INITIAL DATA TEST
                                            ;*****************************************************************************
 3861 022360  012737  000006  002366                MOV     #6,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3862 022366  012737  000004  002406                MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 3863 022374  013701  002506                        MOV     TESTADD,R1
 3864 022400  012737  026760  002360                MOV     #MTP006,SUPDOADD
 3865 022406  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3866 022412  000207                                RETURN
 3867 022414                                MT0007: SUBTST  <<MT0007        SETUP ADDRESS BIT TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MT0007  SETUP ADDRESS BIT TEST
                                            ;*****************************************************************************
 3868 022414  012737  000007  002366                MOV     #7,REALPAT              ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3869 022422  005002                                CLR     R2
 3870 022424  004737  035344                        CALL    BACKGND                 ;OF ZEROS
 3871 022430  012701  060000                        MOV     #FIRST,R1
 3872 022434  012702  C00001                        MOV     #1,R2
 3873 022440  050201                                BIS     R2,R1
 3874 022442  012737  027150  002360                MOV     #MTP007,SUPDOADD
 3875 022450  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3876 022454  000207                                RETURN
 3877 022456                                MT0010: SUBTST  <<MT0010        SETUP BYTE ADDRESSING TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MT0010  SETUP BYTE ADDRESSING TEST
                                            ;*****************************************************************************
 3878 022456  012737  000010  002366                MOV     #10,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3879 022464  012737  000004  002406                MOV     #4,PCBUMP               ;TRAPS ADD 4 TO PC
 3880 022472  013704  002506                        MOV     TESTADD,R4
 3881 022476  012737  027250  002360                MOV     #MTP010,SUPDOADD
 3882 022504  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3883 022510  000207                                RETURN
```

```
3886 022512                            MT0011: SUBTST  <<MT0011        SETUP CREATE SINGLE BIT ERROR TEST>>
                                       ;*************************************************************************
                                       ;*SUBTEST       MT0011  SETUP CREATE SINGLE BIT ERROR TEST
                                       ;*************************************************************************
3887 022512                                    IF NOECCFLAG IS TRUE THEN $RETURN
     022512  005737  002474                                                      TST NOECCFLAG
     022516  001401                                                             BEQ L270
     022520  000207                                                             RTS PC
     022522                                                                L270:;;;;;;
3888 022522                                    IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
     022522  005737  002442                                                      TST ACTFLAG
     022526  001003                                                             BNE L271
     022530  005737  002444                                                      TST APTFLAG
     022534  001404                                                             BEQ L272
     022536                                                                L271:;;;;;;
3889 022536                                      IF $PASS NE #0 THEN $RETURN
     022536  005737  075142                                                      TST $PASS
     022542  001401                                                             BEQ L273
     022544  000207                                                             RTS PC
     022546                                                                L273:;;;;;;
3890 022546                                    END ;OF IF ACTFLAG
     022546                                                                L272:;;;;;;
3891 022546  012737  000011  002366          MOV     #11,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3892 022554  012737  027356  002360          MOV     #MTP011,SUPDOADD
3893 022562  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3894 022566  000207                          RETURN
3895 022570                            MT0012: SUBTST  <<MT0012        SETUP WRITE BYTE CLEARS SBE TEST>>
                                       ;*************************************************************************
                                       ;*SUBTEST       MT0012  SETUP WRITE BYTE CLEARS SBE TEST
                                       ;*************************************************************************
3896 022570                                    IF NOECCFLAG IS TRUE THEN $RETURN
     022570  005737  002474                                                      TST NOECCFLAG
     022574  001401                                                             BEQ L274
     022576  000207                                                             RTS PC
     022600                                                                L274:;;;;;;
3897 022600                                    IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
     022600  005737  002442                                                      TST ACTFLAG
     022604  001003                                                             BNE L275
     022606  005737  002444                                                      TST APTFLAG
     022612  001404                                                             BEQ L276
     022614                                                                L275:;;;;;;
3898 022614                                      IF $PASS NE #0 THEN $RETURN
     022614  005737  075142                                                      TST $PASS
     022620  001401                                                             BEQ L277
     022622  000207                                                             RTS PC
     022624                                                                L277:;;;;;;
3899 022624                                    END ;OF IF ACTFLAG
     022624                                                                L276:;;;;;;
3900 022624  012737  000012  002366          MOV     #12,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3901 022632  012737  027766  002360          MOV     #MTP012,SUPDOADD
3902 022640  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3903 022644  000207                          RETURN
3904 022646                            MT0013: SUBTST  <<MT0013        SETUP CREATE DOUBLE BIT ERROR TEST>>
                                       ;*************************************************************************
                                       ;*SUBTEST       MT0013  SETUP CREATE DOUBLE BIT ERROR TEST
                                       ;*************************************************************************
3905 022646                                    IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
```

```
        022646  005737  002442                                                  TST ACTFLAG
        022652  001003                                                          BNE L300
        022654  005737  002444                                                  TST APTFLAG
        022660  001404                                                          BEQ L301
        022662                                                          L300:;;;;;;;
 3906   022662                          IF $PASS NE #0 THEN $RETURN
        022662  005737  075142                                                  TST $PASS
        022666  001401                                                          BEQ L302
        022670  000207                                                          RTS PC
        022672                                                          L302:;;;;;;;
 3907   022672                          END ;OF IF ACTFLAG
        022672                                                          L301:;;;;;;;
 3908   022672  012737  000013  002366          MOV     #13,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3909   022700  012737  030344  002360          MOV     #MTP013,SUPDOADD
 3910   022706  012737  000003  002100          MOV     #3,NOPAR                ;INDICATE PARITY ACRION
 3911   022714  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3912   022720  000207                          RETURN
 3913   022722                  MT0014: SUBTST  <<MT0014        SETUP WRITE INHIBIT DURING DATIP WITH DBE>>
                                ;*****************************************************************************
                                ;*SUBTEST       MT0014  SETUP WRITE INHIBIT DURING DATIP WITH DBE
                                ;*****************************************************************************
 3914   022722                          IF NOECCFLAG IS TRUE THEN $RETURN
        022722  005737  002474                                                  TST NOECCFLAG
        022726  001401                                                          BEQ L303
        022730  000207                                                          RTS PC
        022732                                                          L303:;;;;;;;
 3915   022732                          IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
        022732  005737  002442                                                  TST ACTFLAG
        022736  001003                                                          BNE L304
        022740  005737  002444                                                  TST APTFLAG
        022744  001404                                                          BEQ L305
        022746                                                          L304:;;;;;;;
 3916   022746                          IF $PASS NE #0 THEN $RETURN
        022746  005737  075142                                                  TST $PASS
        022752  001401                                                          BEQ L306
        022754  000207                                                          RTS PC
        022756                                                          L306:;;;;;;;
 3917   022756                          END ;OF IF ACTFLAG
        022756                                                          L305:;;;;;;;
 3918   022756  012737  000014  002366          MOV     #14,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 3919   022764  012737  030716  002360          MOV     #MTP014,SUPDOADD
 3920   022772  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3921   022776  000207                          RETURN
```

```
3924 023000                          MT0015: SUBTST  <<MT0015        SETUP WRITE INHIBIT OF BYTE WITH DBE>>
                                     ;*********************************************************************
                                     ;*SUBTEST        MT0015  SETUP WRITE INHIBIT OF BYTE WITH DBE
                                     ;*********************************************************************
3925 023000                                  IF NOECCFLAG IS TRUE THEN $RETURN
     023000  005737  002474                                                      TST NOECCFLAG
     023004  001401                                                              BEQ L307
     023006  000207                                                              RTS PC
     023010                                                                 L307:;;;;;;;
3926 023010                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
     023010  005737  002442                                                      TST ACTFLAG
     023014  001003                                                              BNE L310
     023016  005737  002444                                                      TST APTFLAG
     023022  001404                                                              BEQ L311
     023024                                                                 L310:;;;;;;;
3927 023024                                    IF $PASS NE #0 THEN $RETURN
     023024  005737  075142                                                      TST $PASS
     023030  001401                                                              BEQ L312
     023032  000207                                                              RTS PC
     023034                                                                 L312:;;;;;;;
3928 023034                                  END ;OF IF ACTFLAG
     023034                                                                 L311:;;;;;;;
3929 023034  012737  000015  002366          MOV     #15,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3930 023042  012737  031312  002360          MOV     #MTP015,SUPDOADD
3931 023050  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3932 023054  000207                          RETURN
3933 023056                          MT0016: SUBTST  <<MT0016        SETUP WRITE INHIBIT OF WORD WITH DBE>>
                                     ;*********************************************************************
                                     ;*SUBTEST        MT0016  SETUP WRITE INHIBIT OF WORD WITH DBE
                                     ;*********************************************************************
3934 023056                                  IF NOECCFLAG IS TRUE THEN $RETURN
     023056  005737  002474                                                      TST NOECCFLAG
     023062  001401                                                              BEQ L313
     023064  000207                                                              RTS PC
     023066                                                                 L313:;;;;;;;
3935 023066                                  IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
     023066  005737  002442                                                      TST ACTFLAG
     023072  001003                                                              BNE L314
     023074  005737  002444                                                      TST APTFLAG
     023100  001404                                                              BEQ L315
     023102                                                                 L314:;;;;;;;
3936 023102                                    IF $PASS NE #0 THEN $RETURN
     023102  005737  075142                                                      TST $PASS
     023106  001401                                                              BEQ L316
     023110  000207                                                              RTS PC
     023112                                                                 L316:;;;;;;;
3937 023112                                  END ;OF IF ACTFLAG
     023112                                                                 L315:;;;;;;;
3938 023112  012737  000016  002366          MOV     #16,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3939 023120  012737  031700  002360          MOV     #MTP016,SUPDOADD
3940 023126  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
3941 023132  000207                          RETURN
3942 023134                          MT0017: SUBTST  <<MT0017        SETUP HOLDING 1'S & 0'S>>
                                     ;*********************************************************************
                                     ;*SUBTEST        MT0017  SETUP HOLDING 1'S & 0'S
                                     ;*********************************************************************
3943 023134  012737  000017  002366          MOV     #17,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
```

```
 3944 023142  012737  032302  002360          MOV     #MTP017,SUPDOADD
 3945 023150  004737  026220                  CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 3946 023154  000207                          RE*URN
```

```
3949 023156                            MT0020: SUBTST  <<MT0020        SETUP MARCHING 0'S & 1'S IN CHECKBITS TEST>>
                                               ;*****************************************************************************
                                               ;*SUBTEST       MT0020  SETUP MARCHING 0'S & 1'S IN CHECKBITS TEST
                                               ;*****************************************************************************
3950 023156                                            IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
     023156  005737  002442                                                                    TST ACTFLAG
     023162  001003                                                                            BNE L317
     023164  005737  002444                                                                    TST APTFLAG
     023170  001404                                                                            BEQ L320
     023172                                                                          L317:;;;;;;;
3951 023172                                              IF $PASS NE #0 THEN $RETURN
     023172  005737  075142                                                                    TST $PASS
     023176  001401                                                                            BEQ L321
     023200  000207                                                                            RTS PC
     023202                                                                          L321:;;;;;;;
3952 023202                                            END ;OF IF ACTFLAG
     023202                                                                          L320:;;;;;;;
3953 023202  012737  000020  002366                    MOV     #20,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
3954 023210  005037  002100                            CLR     NOPAR           ;INDICATE PARITY ACTION
3955 023214  012737  032572  002360                    MOV     #MTPA20,SUPDOADD
3956 023222  013700  002334                            MOV     MKCSRS,R0
3957 023226                                            FOR MTV020 := #0 TO #34 BY #4
     023226  005037  023320                                                                    CLR MTV020
     023232                                                                          B35:;;;;;;;
3958 023232  013737  023320  002256                      MOV   MTV020,CSRNO
3959 023240  106300                                      ASLB  R0
3960 023242                                              ON.ERROR
     023242  103016                                                                            BCC L322
3961 023244  112737  000060  002422                        MOVB        #'0,SIDE
3962 023252  004737  017610                              CALL        INTKRAP
3963 023256                                              IF SPECIAL IS FALSE
     023256  005737  002432                                                                    TST SPECIAL
     023262  001002                                                                            BNE L323
3964 023264  006237  002414                                ASR       CSRINC
3965 023270                                              END ;OF IF SPECIAL
     023270                                                                          L323:;;;;;;;
3966                                                     ;NOW CSRFIRST & CSRINC ARE SETUP
3967 023270                                              PUSH        R0
     023270  010046                                                                            MOV R0,-(SP)
3968 023272  004737  023322                              CALL        MT020Z
3969 023276                                              POP         R0
     023276  012600                                                                            MOV (SP)+,R0
3970 023300                                            END ;OF ON.ERROR
     023300                                                                          L322:;;;;;;;
3971 023300                                            END ;OF FOR CSRNO
     023300  062737  000004  023320                                                            ADD #4,MTV020
     023306  023727  023320  000034                                                            CMP MTV020,#34
     023314  003746                                                                            BLE B35
     023316                                                                          E35:;;;;;;;;
3972 023316  000207                                    RETURN
3973 023320  000000                            MTV020: 0                               ;VARIABLE FOR PAT 20
3974
3975 023322  013700  002336                    MT020Z: MOV     CSRFIRST,R0
3976 023326  010001                                    MOV     R0,R1
3977 023330  013702  002414                            MOV     CSRINC,R2
3978 023334  005003                                    CLR     R3
3979 023336  012704  100000                            MOV     #BIT15,R4
```

```
 3980 023342  012705  160000                MOV     #LAST+2,R5
 3981 023346  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 3982 023350                                BMOV    MTP20A
      023350  004537  043710                    JSR R5,BLOCK1
      023354  032360                            MTP20A
                                                .DSABL      CRF
 3983 023356  004737  026042                CALL    SUPD01
 3984 023362                                IF #SW11 SET.IN @SWR OR OVFLAG IS TRUE
      023362  032777  004000  157376                                          BIT #SW11,@SWR
      023370  001003                                                         BNE L324
      023372  005737  002440                                                 TST OVFLAG
      023376  001401                                                         BEQ L325
      023400                                                          L324:::::::
 3985 023400                                  GOTO  MT020Y
      023400  000434                                                         BR MT020Y
 3986 023402                                END ;OF IF #SW11
      023402                                                          L325:::::::
 3987 023402                                BMOV    MTP20B
      023402  004537  043710                    JSR R5,BLOCK1
      023406  032376                            MTP20B
                                                .DSABL      CRF
 3988 023410  004737  026056                CALL    SUPD02
 3989 023414                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
      023414  032777  000001  157344                                          BIT #SW0,@SWR
      023422  001003                                                         BNE L326
      023424  005737  002442                                                 TST ACTFLAG
      023430  001402                                                         BEQ L327
      023432                                                          L326:::::::
 3990 023432  104477                          WAS1SBE                 ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
 3991 023434                                  ON.ERROR THEN GOTO MT020X
      023434  103463                                                         BCS MT020X
 3992 023436                                END ;OF IF #SW0
      023436                                                          L327:::::::
 3993 023436                                BMOV    MTP20C
      023436  004537  043710                    JSR R5,BLOCK1
      023442  032430                            MTP20C
                                                .DSABL      CRF
 3994 023444  004737  026056                CALL    SUPD02
 3995 023450                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
      023450  032777  000001  157310                                          BIT #SW0,@SWR
      023456  001003                                                         BNE L330
      023460  005737  002442                                                 TST ACTFLAG
      023464  001402                                                         BEQ L331
      023466                                                          L330:::::::
 3996 023466  104477                          WAS1SBE                 ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
 3997 023470                                  ON.ERROR THEN GOTO MT020X
      023470  103445                                                         BCS MT020X
 3998 023472                                END ;OF IF #SW0
      023472                                                          L331:::::::
 3999 023472  013701  002336          MT020Y: MOV     CSRFIRST,R1
 4000 023476                                BMOV    MTP20D
      023476  004537  043710                    JSR R5,BLOCK1
      023502  032462                            MTP20D
                                                .DSABL      CRF
 4001 023504  004737  026056                CALL    SUPD02
 4002 023510                                IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
      023510  032777  000001  157250                                          BIT #SW0,@SWR
```

```
        023516  001003                                                  BNE L332
        023520  005737  002442                                          TST ACTFLAG
        023524  001402                                                  BEQ L333
        023526                                                        L332:;;;;;;
 4003   023526  104477                WAS1SBE                 ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED SR
 4004   023530                        ON.ERROR THEN GOTO MT020X
        023530  103425                                                  BCS MT020X
 4005   023532                      END ;OF IF #SW0
        023532                                                        L333:;;;;;;
 4006   023532                      BMOV    MTP20E
        023532  004537  043710          JSR R5,BLOCK1
        023536  032514                  MTP20E
                                        .DSABL      CRF
 4007   023540  004737  026056      CALL    SUPD02
 4008   023544                      IF #SW0 SET.IN @SWR OR ACTFLAG IS TRUE
        023544  032777  000001  157214                                  BIT #SW0,@SWR
        023552  001003                                                  BNE L334
        023554  005737  002442                                          TST ACTFLAG
        023560  001402                                                  BEQ L335
        023562                                                        L334:;;;;;;
 4009   023562  104477                WAS1SBE                 ;WAS THERE ANY SINGLE BIT ERRORS ON 1 SELECTED CSR
 4010   023564                        ON.ERROR THEN GOTO MT020X
        023564  103407                                                  BCS MT020X
 4011   023566                      END ;OF IF #SW0
        023566                                                        L335:;;;;;;
 4012   023566                      BMOV    MTP20F
        023566  004537  043710          JSR R5,BLOCK1
        023572  032546                  MTP20F
                                        .DSABL      CRF
 4013   023574  004737  026056      CALL    SUPD02
 4014   023600  104503              CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4015   023602  000207              RETURN
 4016
 4017   023604  004737  026234  MT020X: CALL    SUPD04
 4018   023610  000207              RETURN
```

```
4021 023612                                MT0021: SUBTST  <<MT0021        SETUP MARCHING 0'S & 1'S TEST>>
                                           ;*********************************************************************
                                           ;*SUBTEST       MT0021  SETUP MARCHING 0'S & 1'S TEST
                                           ;*********************************************************************
4022 023612                                        SET NOSCOPE
     023612  012737  177777  002540                                                    MOV  #-1,NOSCOPE
4023 023620  012737  000021  002366                MOV     #21,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4024 023626  013702  002762                        MOV     BAKPAT,R2
4025 023632  004737  035344                        CALL    BACKGND
4026 023636  010203                                MOV     R2,R3
4027 023640  000303                                SWAB    R3
4028 023642  012701  160000                        MOV     #LAST+2,R1
4029 023646  010105                                MOV     R1,R5
4030 023650  012704  060000                        MOV     #FIRST,R4
4031 023654                                        BMOV    MTPA21
     023654  004537  043710                            JSR R5,BLOCK1
     023660  033234                                    MTPA21
                                                     .DSABL      CRF
4032 023662  004737  026042                        CALL    SUPD01
4033
4034 023666                                        BMOV    MTPB21
     023666  004537  043710                            JSR R5,BLOCK1
     023672  033264                                    MTPB21
                                                     .DSABL      CRF
4035 023674  004737  026056                        CALL    SUPD02
4036
4037 023700  010401                                MOV     R4,R1
4038 023702                                        BMOV    MTPC21
     023702  004537  043710                            JSR R5,BLOCK1
     023706  033320                                    MTPC21
                                                     .DSABL      CRF
4039 023710  004737  026056                        CALL    SUPD02
4040
4041 023714                                        BMOV    MTPD21
     023714  004537  043710                            JSR R5,BLOCK1
     023720  033354                                    MTPD21
                                                     .DSABL      CRF
4042 023722  004737  026056                        CALL    SUPD02
4043 023726  005037  002540                        CLR     NOSCOPE
4044 023732  000207                                RETURN
4045
4046 023734                                MT0022: SUBTST  <<MT0022        SETUP REFRESH & SHIFTING DIAGONAL TEST>>
                                           ;*********************************************************************
                                           ;*SUBTEST       MT0022  SETUP REFRESH & SHIFTING DIAGONAL TEST
                                           ;*********************************************************************
4047 023734  004737  026006                        CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
4048 023740                                        ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
     023740  103001                                                                        BCC L336
     023742  000207                                                                        RTS PC
     023744                                                                          L336:;;;;;;
4049 023744  012737  000022  002366                MOV     #22,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4050 023752  012737  033404  002360                MOV     #MTP022,SUPDOADD
4051 023760  004737  026220                        CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
4052 023764  000207                                RETURN
4053
4054 023766                                MT0023: SUBTST  <<MT0023        SHIFTING DIAGONAL TEST>>
                                           ;*********************************************************************
```

```
                                        ;*SUBTEST       MT0023  SHIFTING DIAGONAL TEST
                                        ;*****************************************************************************
 4055 023766  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4056 023772                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
      023772  103001                                                                   BCC L337
      023774  000207                                                                   RTS PC
      023776                                                                    L337:::::::
 4057 023776  012737  000023  002366            MOV     #23,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4058 024004  012737  033404  002360            MOV     #MTP022,SUPDOADD
 4059 024012                                    SET     DIAGFLAG                ;IDENTIFY DIAGONAL TEST TO MTP022
      024012  012737  177777  002006                                                   MOV  #-1,DIAGFLAG
 4060 024020  004737  026220                    CALL    SUPD03                  ;DO IT IN SUPERVISOR MODE
 4061 024024  005037  00200E                    CLR     DIAGFLAG
 4062 024030  000207                            RETURN
```

```
 4064 024032                        MT0024: SUBTST  <<MT0024        SETUP FAST GALLOPING PATTERN TEST>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       MT0024  SETUP FAST GALLOPING PATTERN TEST
                                    ;*****************************************************************************
 4065 024032  004737  026006               CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4066 024036                               ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
      024036  103001                                                                    BCC L340
      024040  000207                                                                    RTS PC
      024042                                                                  L340:;;;;;;;
 4067 024042                               SET     NOSCOPE
      024042  012737  177777  002540                                                    MOV  #-1,NOSCOPE
 4068 024050  012737  000024  002366       MOV     #24,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4069 024056  013702  002762               MOV     BAKPAT,R2
 4070 024062  004737  035344               CALL    BACKGND
 4071 024066  010203                       MOV     R2,R3
 4072 024070  010304                       MOV     R3,R4
 4073 024072  000304                       SWAB    R4
 4074 024074  012701  060000               MOV     #FIRST,R1
 4075 024100  012705  157776               MOV     #LAST,R5
 4076 024104  104415                       SAVREG
 4077 024106                               BMOV    MTPA24
      024106  004537  043710                   JSR R5,BLOCK1
      024112  034060                       MTPA24
                                           .DSABL      CRF
 4078 024114                               BMOV    MTPB24,SDPAR0,8.
      024114  004537  043744                   JSR R5,BLOCK3
      024120  000010                       8.
      024122  172260                       SDPAR0
      024124  034120                       MTPB24
                                           .DSABL      CRF
 4079 024126                               BMOV    MTPC24,KDPAR0,8.
      024126  004537  043744                   JSR R5,BLOCK3
      024132  000010                       8.
      024134  172360                       KDPAR0
      024136  034134                       MTPC24
                                           .DSABL      CRF
 4080 024140  012737  172260  002360       MOV     #SDPAR0,SUPDOADD
 4081 024146  004737  026234               CALL    SUPD04
 4082
 4083                                      ;DO IT AGAIN FOR COMPLEMENT DATA
 4084 024152  104416                       RESREG
 4085 024154  000302                       SWAB    R2
 4086 024156  000303                       SWAB    R3
 4087 024160  004737  026234               CALL    SUPD04
 4088 024164  005037  002540               CLR     NOSCOPE
 4089 024170  000207                       RETURN
 4090 024172                        MT0025: SUBTST  <<MT0025        SETUP INTERRUPT ENABLE TEST>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       MT0025  SETUP INTERRUPT ENABLE TEST
                                    ;*****************************************************************************
 4091 024172                               IF ACTFLAG IS TRUE OR APTFLAG IS TRUE
      024172  005737  002442                                                            TST ACTFLAG
      024176  001003                                                                    BNE L341
      024200  005737  002444                                                            TST APTFLAG
      024204  001404                                                                    BEQ L342
      024206                                                                  L341:;;;;;;;
 4092 024206                                 IF $PASS NE #0 THEN $RETURN
```

```
        024206  005737  075142                                                  TST $PASS
        024212  001401                                                          BEQ L343
        024214  000207                                                          RTS PC
        024216                                                          L343:;;;;;;;
  4093  024216                          END ;OF IF ACTFLAG
        024216                                                          L342:;;;;;;;
  4094  024216  012737  000025  002366  MOV     #25,REALPAT           ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
  4095  024224  012737  034152  002360  MOV     #MTP025,SUPDOADD
  4096  024232  004737  026220          CALL    SUPD03                ;DO IT IN SUPERVISOR MODE
  4097  024236  000207                  RETURN
```

```
4100 024240                            MT0026: SUBTST  <<MT0026        SETUP RANDOM DATA TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MT0026  SETUP RANDOM DATA TEST
                                       ;*****************************************************************************
4101 024240  012737  000026  002366            MOV     #26,REALPAT
4102 024246  005037  002406                    CLR     PCBUMP                  ;TRAPS DO NOT ADD TO THE PC
4103 024252  013703  002716                    MOV     SEEDLO,R3               ;INITIALIZE RANDOM NUMBERS
4104 024256  013702  002714                    MOV     SEEDHI,R2
4105 024262  010305                            MOV     R3,R5
4106 024264  010204                            MOV     R2,R4
4107 024266  012701  060000                    MOV     #FIRST,R1
4108 024272  012700  020000                    MOV     #SIZE/2,R0
4109 024276  104415                            SAVREG
4110 024300                                    BMOV    MTPA26                  ;WRITE ROUTINE TO FAST MEMORY
     024300  004537  043710                        JSR R5,BLOCK1
     024304  034576                            MTPA26
                                               .DSABL      CRF
4111 024306                                    BMOV    MTPC26,KDPAR0,8.        ;RANDOM SUBPROGRAM TO FAST MEMORY
     024306  004537  043744                        JSR R5,BLOCK3
     024312  000010                            8.
     024314  172360                            KDPAR0
     024316  034646                            MTPC26
                                               .DSABL      CRF
4112 024320                                    BMOV    MTPD26,SDPAR0,8.        ;RANDOM SUBSUBPROGRAM TO FAST MEMORY
     024320  004537  043744                        JSR R5,BLOCK3
     024324  000010                            8.
     024326  172260                            SDPAR0
     024330  034666                            MTPD26
                                               .DSABL      CRF
4113 024332  004737  026042                    CALL    SUPD01                  ;WRITE RANDOM DATA
4114 024336  005037  034626                    CLR     RANODD                  ;FOR ERROR REPORTING
4115 024342                                    BMOV    MTPB26                  ;READ ROUTINE TO FAST MEMORY
     024342  004537  043710                        JSR R5,BLOCK1
     024346  034612                            MTPB26
                                               .DSABL      CRF
4116 024350  104416                            RESREG
4117 024352  004737  026042                    CALL    SUPD01                  ;READ RANDOM DATA
4118 024356  010337  002716                    MOV     R3,SEEDLO               ;UPDATE FOR NEW RANDOM NUMBERS
4119 024362  010237  002714                    MOV     R2,SEEDHI
4120 024366  000207                            RETURN
```

```
 4123 024370                                MT0027: SUBTST  <<MT0027        UNIQUE BANK TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MT0027  UNIQUE BANK TEST
                                            ;*****************************************************************************
 4124                                               ;MAKE SURE THAT EACH BANK CAN HAVE UNIQUE DATA
 4125                                               ;WRITE AND READ THE BANK NUMBER IN EACH BANK (EXCEPT WHERE THE PROGRAM IS)
 4126 024370  012737  000027  002366                MOV     #27,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4127 024376                                        CLEAR   MARGIN,MAINT            ;CLEAR MARGINS
      024376  005037  002112                                                                    CLR  MARGIN
      024402  005037  177750                                                                    CLR  MAINT
 4128 024406  104502                                CLRCSR                          ;CLEAR MK11 CSRS
 4129 024410                                        BMOV    MTP000
      024410  004537  043710                            JSR R5,BLOCK1
      024414  026376                                   MTP000
                                                        .DSABL      CRF
 4130 024416  012737  000207  177644  WARN7:        MOV     #207,UIPAR2             ;PUT 'RETURN' INSTRUCTION AFTER WRITE ROUTINE
 4131 024424  012737  177646  002360                MOV     #UIPAR3,SUPDOADD
 4132 024432                                        SET NOFSMODE
      024432  012737  177777  002526                                                           MOV  #-1,NOFSMODE
 4133 024440                                        FOR I := #1 TO #2
      024440  012737  000001  002602                                                           MOV #1,I
      024446                                                                        B36:::::::
 4134 024446                                          FOR BANK := #0 TO #167
      024446  005037  002106                                                                    CLR BANK
      024452                                                                        B37:::::::
 4135 024452  004737  042422                            CALL EXBANK
 4136 024456                                            IF ACFLAG IS TRUE AND RRFLAG IS FALSE
      024456  005737  002124                                                                    TST ACFLAG
      024462  001430                                                                            BEQ L344
      024464  005737  002132                                                                    TST RRFLAG
      024470  001025                                                                            BNE L344
 4137 024472  104511                                      INVALIDATE                ;INVALIDATE BACKGROUND PATTERN ON 'BANK'
 4138 024474                                            LET R2 := BANK
      024474  013702  002106                                                                    MOV BANK,R2
 4139 024500  012700  060000                            MOV       #FIRST,R0
 4140 024504  010004                                    MOV       R0,R4
 4141 024506  012701  040000                            MOV       #SIZE,R1
 4142 024512  010103                                    MOV       R1,R3
 4143 024514                                            IF I EQ #1
      024514  023727  002602  000001                                                           CMP I,#1
      024522  001002                                                                           BNE L345
 4144 024524  004737  026042                              CALL    SUPD01
 4145 024530                                            END ;OF IF
      024530                                                                        L345:::::::
 4146 024530                                            IF I EQ #2
      024530  023727  002602  000002                                                           CMP I,#2
      024536  001002                                                                           BNE L346
 4147 024540  004737  026220                              CALL    SUPD03
 4148 024544                                            END ;OF IF
      024544                                                                        L346:::::::
 4149 024544                                          END ;OF IF
      024544                                                                        L344:::::::
 4150 024544                                        END :OF FOR BANK
      024544  005237  002106                                                                  INC BANK
      024550  023727  002106  000167                                                          CMP BANK,#167
      024556  003735                                                                          BLE B37
      024560                                                                        E37:::::::
```

```
4151 024560                                    END ;OF FOR I
     024560  005237  002602                                      INC I
     024564  023727  002602  000002                              CMP I,#2
     024572  003725                                              BLE B36
     024574                                                E36:;;;;;;;
4152 024574                                    IF FS7FLAG IS TRUE
     024574  005737  002546                                      TST FS7FLAG
     024600  001403                                              BEQ L347
4153 024602  005037  002526                      CLR   NOFSMODE
4154 024606  000207                            RETURN
4155 024610                                    END ;OF IF FS7FLAG
     024610                                                L347:;;;;;;;
4156 024610                                    FOR I := #1 TO #2
     024610  012737  000001  002602                              MOV #1,I
     024616                                                B40:;;;;;;;
4157 024616                                      FOR BANK := #167 DOWNTO #0
     024616  012737  000167  002106                              MOV #167,BANK
     024624                                                B41:;;;;;;;
4158 024624  004737  042422                        CALL EXBANK
4159 024630                                        IF ACFLAG IS TRUE AND RRFLAG IS FALSE
     024630  005737  002124                                      TST ACFLAG
     024634  001430                                              BEQ L350
     024636  005737  002132                                      TST RRFLAG
     024642  001025                                              BNE L350
4160 024644                                          LET R2 := BANK
     024644  013702  002106                                      MOV BANK,R2
4161 024650  005102                                  COM     R2
4162 024652  012700  060000                          MOV     #FIRST,R0
4163 024656  010004                                  MOV     R0,R4
4164 024660  012701  040000                          MOV     #SIZE,R1
4165 024664  010103                                  MOV     R1,R3
4166 024666                                          IF I EQ #1
     024666  023727  002602  000001                              CMP I,#1
     024674  001002                                              BNE L351
4167 024676  004737  026042                            CALL    SUPD01
4168 024702                                          END ;OF IF
     024702                                                L351:;;;;;;;
4169 024702                                          IF I EQ #2
     024702  023727  002602  000002                              CMP I,#2
     024710  001002                                              BNE L352
4170 024712  004737  026220                            CALL    SUPD03
4171 024716                                          END ;OF IF
     024716                                                L352:;;;;;;;
4172 024716                                        END ;OF IF
     024716                                                L350:;;;;;;;
4173 024716                                      END ;OF FOR BANK
     024716  005337  002106                                      DEC BANK
     024722  023727  002106  000000                              CMP BANK,#0
     024730  002335                                              BGE B41
     024732                                                E41:;;;;;;;
4174 024732                                    END ;OF FOR I
     024732  005237  002602                                      INC I
     024736  023727  002602  000002                              CMP I,#2
     024744  003724                                              BLE B40
     024746                                                E40:;;;;;;;
4175 024746  005037  002526                    CLR     NOFSMODE
4176 024752  000207                          RETURN
```

```
                                MT0030: SUBTST  <<MT0030        SETUP FLUSH OUT DBE'S TEST>>
                                ;*************************************************************************
                                ;*SUBTEST        MT0030  SETUP FLUSH OUT DBE'S TEST
                                ;*************************************************************************
4180 024754  005037  002362                     CLR     PASFLG
4181 024760  012737  000030  002366  MTA030:    MOV     #30,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4182 024766                                     CLEAR   MARGIN,MAINT            ;CLEAR MARGINS
     024766  005037  002112                                                                  CLR  MARGIN
     024772  005037  177750                                                                  CLR  MAINT
4183 024776  012737  000001  002100             MOV     #1,NOPAR                ;INDICATE COUNT PARITY ERRORS
4184 025004                                     BMOV    MTP030
     025004  004537  043710                         JSR R5,BLOCK1
     025010  034704                                 MTP030
                                                    .DSABL      CRF
4185 025012  104470                             ECCDIS                          ;DISABLE ERROR CORRECTION
4186 025014                                     SET     NOFSMODE,NOSCOPE
     025014  012737  177777  002526                                                          MOV  #-1,NOFSMODE
     025022  012737  177777  002540                                                          MOV  #-1,NOSCOPE
4187 025030                                     FOR BANK := #0 TO #167
     025030  005037  002106                                                                  CLR BANK
     025034                                                                         B42:::::::
4188 025034  004737  042422                       CALL  EXBANK
4189 025040                                       IF MKFLAG IS TRUE
     025040  005737  002126                                                                  TST MKFLAG
     025044  001414                                                                          BEQ L353
4190 025046                                         IF ACFLAG IS TRUE AND RRFLAG IS FALSE
     025046  005737  002124                                                                  TST ACFLAG
     025052  001411                                                                          BEQ L354
     025054  005737  002132                                                                  TST RRFLAG
     025060  001006                                                                          BNE L354
4191 025062  012701  040000                           MOV       #SIZE,R1
4192 025066  012700  060000                           MOV       #FIRST,R0
4193 025072  004737  026042                           CALL      SUPD01
4194 025076                                         END ;OF IF ACFLAG
     025076                                                                         L354:::::::
4195 025076                                       END ;OF IF MKFLAG
     025076                                                                         L353:::::::
4196 025076                                     END ;OF FOR
     025076  005237  002106                                                                  INC BANK
     025102  023727  002106  000167                                                          CMP BANK,#167
     025110  003751                                                                          BLE B42
     025112                                                                         E42:::::::
4197 025112                                     IF PASFLG IS FALSE
     025112  005737  002362                                                                  TST PASFLG
     025116  001030                                                                          BNE L355
4198 025120                                       SET PASFLG
     025120  012737  177777  002362                                                          MOV  #-1,PASFLG
4199 025126  104502                               CLRCSR                        ;CLEAR MK11 CSRS
4200 025130  004737  041130                       CALL  RELOCATE
4201 025134                                       ON.ERROR
     025134  103006                                                                          BCC L356
4202 025136  104472                                 ECCINIT             ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
4203 025140                                         CLEAR       NOFSMODE,NOSCOPE
     025140  005037  002526                                                                  CLR  NOFSMODE
     025144  005037  002540                                                                  CLR  NOSCOPE
4204 025150  000207                                 RETURN
4205 025152                                       END ;OF ON.ERROR
```

```
                025152                                                                  L356:;;;;;;
  4206 025152   013737  002400  002106            MOV   NEWBANK,BANK
  4207 025160   004737  042422                    CALL  EXBANK
  4208 025164   004737  024760                    CALL  MTA030
  4209 025170   104472                            ECCINIT               ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
  4210 025172   004737  041604                    CALL  UNRELOCATE
  4211 025176   000207                            RETURN
  4212 025200                                   END ;OF IF PASFLG
                025200                                                                  L355:;;;;;;;
  4213 025200   104472                          ECCINIT           ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
  4214 025202                                   CLEAR   NOFSMODE,NOSCOPE
       025202   005037  002526                                                                CLR   NOFSMODE
       025206   005037  002540                                                                CLR   NOSCOPE
  4215 025212   000207                          RETURN
```

```
                                        MT0031: SUBTST  <<MT0031        SETUP SOB-A-LONG TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MT0031  SETUP SOB-A-LONG TEST
                                        ;*****************************************************************************
4219 025214  004737  026006             CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
4220 025220                             ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
     025220  103001                                                                     BCC L357
     025222  000207                                                                     RTS PC
     025224                                                                     L357:;;;;;;
4221 025224                             SET     NOSCOPE                                 MOV  #-1,NOSCOPE
     025224  012737  177777  002540
4222 025232  012737  000031  002366     MOV     #31,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4223 025240  005037  002100             CLR     NOPAR                   ;SETUP PARITY ACTION
4224 025244                             MAP     BANK                    ;MAP FIRST SO BLOCK MOVE WORKS
     025244  010346                                                                     MOV R3,-(SP)
     025246  013703  002106             MOV     BANK,R3
     025252  004737  040700             CALL    MAPPER
                                        .DSABL  CRF
     025256  012603                                                                     MOV (SP)+,R3
4225 025260                             SUPERVISOR              ;ENTER SUPERVISOR MODE
     025260  052737  040000  177776     BIS     #BIT14,PSW              ;DO IT TO IT
                                        .DSABL  CRF
4226 025266                             BMOV    MTP031,FIRST,SOBLENGTH/2
     025266  004537  043744                 JSR R5,BLOCK3
     025272  000027                      SOBLENGTH/2
     025274  060000                      FIRST
     025276  034714                      MTP031
                                          .DSABL        CRF
4227 025300  104417                     KERNEL                  ;ENTER KERNEL MODE
4228 025302  013702  002704             MOV     SOBK,R2
4229 025306  010200                     MOV     R2,R0
4230 025310  012701  100776             MOV     #100776,R1              ;COMPLEMENT OF INSTRUCTION "SOB R0,DOT"
4231 025314  012705  060056             MOV     #FIRST+SOBLENGTH,R5
4232 025320  012737  060002  002360     MOV     #FIRST+2,SUPDOADD
4233 025326  004737  026234             CALL    SUPD04
4234 025332  005037  002540             CLR     NOSCOPE
4235 025336  000207                     RETURN
```

```
 4238 025340                            MT0033: SUBTST  <<MT0033        SETUP WRITE RECOVERY TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MT0033  SETUP WRITE RECOVERY TEST
                                        ;*****************************************************************************
 4239 025340  004737  026006                    CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
 4240 025344                                    ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
      025344  103001                                                                    BCC L360
      025346  000207                                                                    RTS PC
      025350                                                                    L360:::::::
 4241 025350                                    SET     NOSCOPE                         MOV  #-1,NOSCOPE
      025350  012737  177777  002540
 4242 025356  012737  000033  002366            MOV     #33,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
 4243 025364  005037  002100                    CLR     NOPAR                   ;SETUP PARITY ACTION
 4244 025370                                    MAP     BANK                    ;MAP FIRST SO THAT THE BLOCK MOVE WORKS
      025370  010346                                                                   MOV R3,-(SP)
      025372  013703  002106                    MOV     BANK,R3
      025376  004737  040700                    CALL    MAPPER
                                                .DSABL  CRF
      025402  012603                                                                   MOV (SP)+,R3
 4245 025404  012700  010247                    MOV     #10247,R0               ;OPP CODE OF INSTRUCTION "MOV   R2,-(PC)"
 4246 025410  012701  177667                    MOV     #177667,R1              ;OPP CODE OF COMPLEMENT OF INSTRUCTION "JMP (R0)"
 4247 025414  012702  020000                    MOV     #SIZE/2,R2              ;USED FOR 1/2 BANK LOOP
 4248 025420  012703  060000                    MOV     #FIRST,R3
 4249 025424  012704  160000                    MOV     #LAST+2,R4
 4250
 4251 025430                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
      025430  052737  040000  177776            BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
 4252                                           ;MOVE TEST TO MEMORY UNDER TEST
 4253 025436  010023                    1$:     MOV     R0,(R3)+
 4254 025440  010144                            MOV     R1,-(R4)
 4255 025442  077203                            SOB     R2,1$
 4256
 4257                                           ;MOVE LAST PART OF TEST TO FASTCITY
 4258 025444                                    BMOV    MTP033
      025444  004537  043710                        JSR R5,BLOCK1
      025450  035054                               MTP033
                                                    .DSABL      CRF
 4259 025452  104417                            KERNEL                  ;ENTER KERNEL MODE
 4260
 4261 025454  012702  005141                    MOV     #5141,R2                ;OPP CODE OF INSTRUCTION "COM   -(R1)"
 4262 025460  012700  025526                    MOV     #2$,R0                  ;ADDRESS TO RETURN TO IN R0
 4263 025464  012701  160000                    MOV     #LAST+2,R1              ;TOP OF BANK
 4264 025470  012737  060000  002360            MOV     #FIRST,SUPDOADD
 4265 025476  004737  026234                    CALL    SUPD04
 4266 025502  012703  020000                    MOV     #SIZE/2,R3
 4267 025506  012705  000110                    MOV     #110,R5
 4268 025512  012704  060000                    MOV     #FIRST,R4
 4269 025516  004737  026056                    CALL    SUPD02
 4270 025522  005037  002540                    CLR     NOSCOPE
 4271 025526  000207                    2$:     RETURN                  ;THIS RETURN ACTS AS A NORMAL RETURN FROM MT0033
 4272                                                                   ;ALSO A RETURN FROM THE "CALL   SUPD04" ABOVE
 4273
```

```
4276 025530                          MT0034: SUBTST  <<MT0034        SETUP BRANCH GOBBLE TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MT0034  SETUP BRANCH GOBBLE TEST
                                     ;*****************************************************************************
4277 025530  004737  026006                  CALL    KAMITEST                ;CHECK FOR KAMIKAZE MODE
4278 025534                                  ON.ERROR THEN $RETURN           ;IF NOT IN KAMIKAZE MODE RETURN
     025534  103001                                                                      BCC L361
     025536  000207                                                                      RTS PC
     025540                                                                  L361:;;;;;;
4279 025540                                  SET     NOSCOPE
     025540  012737  177777  002540                                                      MOV  #-1,NOSCOPE
4280 025546  012737  000034  002366          MOV     #34,REALPAT             ;SETUP PATTERN NUMBER FOR TYPEOUT & DISPLAY
4281 025554  005037  002100                  CLR     NOPAR                   ;SETUP PARITY ACTION
4282 025560                                  MAP     BANK                    ;MAP FIRST SO THAT BLOCK MOVE WORKS
     025560  010346                                                                      MOV R3,-(SP)
     025562  013703  002106                  MOV     BANK,R3
     025566  004737  040700                  CALL    MAPPER
                                             .DSABL  CRF
     025572  012603                                                                      MOV (SP)+,R3
4283
4284 025574                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
     025574  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT!
                                             .DSABL  CRF
4285 025602                                  BMOV    MTP034,FIRST,GBLENGTH/2
     025602  004537  043744                      JSR R5,BLOCK3
     025606  000037                             GBLENGTH/2
     025610  060000                             FIRST
     025612  035106                             MTP034
                                                 .DSABL      CRF
4286 025614  104417                          KERNEL                  ;ENTER KERNEL MODE
4287
4288 025616  012705  060076                  MOV     #FIRST+GBLENGTH,R5
4289 025622  012737  060004  002360          MOV     #FIRST+4,SUPDOADD
4290 025630  012701  060002                  MOV     #FIRST+2,R1
4291 025634  012702  060003                  MOV     #FIRST+3,R2
4292
4293 025640  004737  026234                  CALL    SUPD04
4294 025644  005037  002540                  CLR     NOSCOPE
4295 025650  000207                          RETURN
4296
4297 025652                          MT0035: SUBTST  <<MT0035        SOFT ERROR - BACKGROUND PATTERN TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MT0035  SOFT ERROR - BACKGROUND PATTERN TEST
                                     ;*****************************************************************************
4298 025652  012737  000035  002366          MOV     #35,REALPAT
4299 025660  012700  060000                  MOV     #FIRST,R0
4300 025664  012701  040000                  MOV     #SIZE,R1
4301 025670  013702  002744                  MOV     SOFTPAT,R2
4302 025674  010103                          MOV     R1,R3
4303 025676  013705  002106                  MOV     BANK,R5
4304 025702  070527  000006                  MUL     #6,R5
4305 025706  010004                          MOV     R0,R4
4306 025710                                  BMOV    MTP000
     025710  004537  043710                      JSR R5,BLOCK1
     025714  026376                             MTP000
                                                 .DSABL      CRF
4307 025716  012737  000207  177644          MOV     #207,UIPAR2             ;PUT RETURN INSTRUCTION AFTER WRITE ROUTINE
```

```
 4308 025724  012737  177646  002360          MOV     #UIPAR3,SUPDOADD
 4309 025732                                  IF #BIT13 SET.IN CONFIG+2(R5) AND WRITEONLY IS FALSE
      025732  032765  020000  003020                                                  BIT #BIT13,CONFIG+2(R5)
      025740  001406                                                                  BEQ L362
      025742  005737  002502                                                         TST WRITEONLY
      025746  001003                                                                 BNE L362
 4310                                           ;BACKGROUND PATTERN IS VALID
 4311 025750  004737  026220                    CALL   SUPD03                   ;READ IT
 4312 025754                                  ELSE
      025754  000405                                                                BR L363
      025756                                                                 L362:::::::
 4313                                           ;BACKGROUND PATTERN HAS BEEN INVALIDATED
 4314 025756  004737  026042                    CALL   SUPD01                   ;WRITE IT
 4315 025762  052765  020000  003020            BIS    #BIT13,CONFIG+2(R5)      ;VALIDATE IT
 4316 025770                                  END ;OF IF #BIT13
      025770                                                                 L363:::::::
 4317 025770  000207                          RETURN
```

```
4320 025772                          MT0999: SUBTST  <<MT0999        SETUP NULL TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MT0999  SETUP NULL TEST
                                     ;*****************************************************************************
4321 025772  005037  002366                  CLR     REALPAT
4322 025776                                  SET     NULLFLAG
     025776  012737  177777  002436                                                    MOV  #-1,NULLFLAG
4323 026004  000207                          RETURN
4324
4325 026006                          KAMITEST:SUBTST <<CHECK FOR KAMIKAZE MODE>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        CHECK FOR KAMIKAZE MODE
                                     ;*****************************************************************************
4326 026006                                  IF KAMIKAZE IS TRUE OR ACTFLAG IS TRUE OR APTFLAG IS TRUE
     026006  005737  002010                                                             TST KAMIKAZE
     026012  001006                                                                     BNE L364
     026014  005737  002442                                                             TST ACTFLAG
     026020  001003                                                                     BNE L364
     026022  005737  002444                                                             TST APTFLAG
     026026  001403                                                                     BEQ L365
     026030                                                                  L364:::::::
4327 026030                                    $RETURN NOERROR              ;RUN THE TEST
     026030  000241                                                                     CLC
     026032  000207                                                                     RTS PC
4328 026034                                  ELSE
     026034  000402                                                                     BR L366
     026036                                                                  L365:::::::
4329 026036                                    $RETURN ERROR                ;DON'T RUN THE TEST
     026036  000261                                                                     SEC
     026040  000207                                                                     RTS PC
4330 026042                                  END ;OF IF KAMIKAZE
     026042                                                                  L366:::::::
```

```
4334 026042                            SUPD01: SUBTST  <<SUBR  EXECUTE PATTERN IN SUPERVISOR>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SUBR    EXECUTE PATTERN IN SUPERVISOR
                                       ;*****************************************************************************
4335 026042                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
     026042  010346                                                                    MOV R3,-(SP)
     026044  013703  002106                    MOV     BANK,R3
     026050  004737  040700                    CALL    MAPPER
                                               .DSABL  CRF
     026054  012603                                                                    MOV (SP)+,R3
4336 026056  004737  066514            SUPD02: CALL    GETDIS
4337 026062                                    PUSH    $LPERR,$LPADR
     026062  013746  002750                                                           MOV $LPERR,-(SP)
     026066  013746  002746                                                           MOV $LPADR,-(SP)
4338 026072  010037  002266                    MOV     R0,SUPDR0
4339 026076  012700  002270                    MOV     #SUPDR1,R0
4340 026102  010120                            MOV     R1,(R0)+
4341 026104  010220                            MOV     R2,(R0)+
4342 026106  010320                            MOV     R3,(R0)+
4343 026110  010420                            MOV     R4,(R0)+
4344 026112  010520                            MOV     R5,(R0)+
4345 026114  010620                            MOV     SP,(R0)+
4346 026116  013700  002266                    MOV     SUPDR0,R0
4347 026122  012737  026136  002746            MOV     #TAG4$,$LPADR
4348 026130  013737  002746  002750            MOV     $LPADR,$LPERR
4349 026136  012700  002304            TAG4$:  MOV     #SUPDR6+2,R0
4350 026142  014006                            MOV     -(R0),SP
4351 026144  014005                            MOV     -(R0),R5
4352 026146  014004                            MOV     -(R0),R4
4353 026150  014003                            MOV     -(R0),R3
4354 026152  014002                            MOV     -(R0),R2
4355 026154  014001                            MOV     -(R0),R1
4356 026156  014000                            MOV     -(R0),R0
4357 026160                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
     026160  052737  040000  177776            BIS     #BIT14,PSW              ;DO IT TO IT'
                                               .DSABL  CRF
4358 026166  012706  000740                    MOV     #SUPSTK,SSP
4359 026172  104424                            CACHOFF                 ;TURN CACHE OFF
4360 026174  004737  177640                    CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
4361 026200  104423                            CACHON                  ;TURN CACHE ON
4362 026202  104417                            KERNEL                  ;ENTER KERNEL MODE
4363 026204  000004                            SCOPE
4364 026206                                    POP     $LPADR,$LPERR
     026206  012637  002746                                                           MOV (SP)+,$LPADR
     026212  012637  002750                                                           MOV (SP)+,$LPERR
4365 026216  000207                            RETURN
```

```
 4369 026220                          SUPD03: MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
      026220  010346                                                                MOV R3,-(SP)
      026222  013703  002106                  MOV     BANK,R3
      026226  004737  040700                  CALL    MAPPER
                                               .DSABL  CRF
      026232  012603                                                              MOV (SP)+,R3
 4370 026234  004737  066514          SUPD04: CALL    GETDIS
 4371 026240                                  PUSH    $LPERR,$LPADR
      026240  013746  002750                                                      MOV $LPERR,-(SP)
      026244  013746  002746                                                      MOV $LPADR,-(SP)
 4372 026250  010037  002266                  MOV     R0,SUPDR0
 4373 026254  012700  002270                  MOV     #SUPDR1,R0
 4374 026260  010120                          MOV     R1,(R0)+
 4375 026262  010220                          MOV     R2,(R0)+
 4376 026264  010320                          MOV     R3,(R0)+
 4377 026266  010420                          MOV     R4,(R0)+
 4378 026270  010520                          MOV     R5,(R0)+
 4379 026272  010620                          MOV     SP,(R0)+
 4380 026274  013700  002266                  MOV     SUPDR0,R0
 4381 026300  012737  026314  002746          MOV     #TBG4$,$LPADR
 4382 026306  013737  002746  002750          MOV     $LPADR,$LPERR
 4383 026314  012700  002304          TBG4$:  MOV     #SUPDR6+2,R0
 4384 026320  014006                          MOV     -(R0),SP
 4385 026322  014005                          MOV     -(R0),R5
 4386 026324  014004                          MOV     -(R0),R4
 4387 026326  014003                          MOV     -(R0),R3
 4388 026330  014002                          MOV     -(R0),R2
 4389 026332  014001                          MOV     -(R0),R1
 4390 026334  014000                          MOV     -(R0),R0
 4391 026336                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
      026336  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT.
                                               .DSABL  CRF
 4392 026344  012706  000740                  MOV     #SUPSTK,SSP
 4393 026350  104424                          CACHOFF                 ;TURN CACHE OFF
 4394 026352  004777  154002                  CALL    @SUPDOADD
 4395 026356  104423                          CACHON                  ;TURN CACHE ON
 4396 026360  104417                          KERNEL                  ;ENTER KERNEL MODE
 4397 026362  000004                          SCOPE
 4398 026364                                  POP     $LPADR,$LPERR
      026364  012637  002746                                                      MOV (SP)+,$LPADR
      026370  012637  002750                                                      MOV (SP)+,$LPERR
 4399 026374  000207                          RETURN
```

```
                                .SBTTL  MEMORY TEST PATTERN ROUTINES
                        ;*******************************************************************************
                        ; PATTERN REGISTER CONVENTIONS
                        ;       R0      FIRST ADDRESS OF PATTERN (FIRST,LAST+2,ETC)
                        ;       R1      NUMBER OF ADDRESSES IN PATTERN (SIZE)
                        ;       R2      DATA FOR PATTERN (ONES,52525,ETC)
                        ;       R3      COPY OF R1 (IF NECESSARY)
                        ;       R4      COPY OF R0 (IF NECESSARY)
                        ;       R5      COPY OF R2 (IF NECESSARY)
                        ;*******************************************************************************
026376                  MTP000: SUBTST  <<MTP000        BASIC DATA TEST>>
                        ;*******************************************************************************
                        ;*SUBTEST       MTP000  BASIC DATA TEST
                        ;*******************************************************************************
026376  010220          1$:     MOV     R2,(R0)+        ;V177640
026400  077102                  SOB     R1,MTP000       ;V177642
026402  000240                  NOP                     ;V177644
026404  012401          2$:     MOV     (R4)+,R1        ;V177646
026406  020102                  CMP     R1,R2           ;V177650
026410  001402                  BEQ     3$              ;V177652
026412  104[illegible]          PERR02                  ;V177654
026414  00024                   NOP                     ;V177656
026416  07730[illegible]  3$:     SOB     R3,2$           ;V177660
026420  000207                  RETURN                  ;V177662
026422                  MTP001: SUBTST  <<MTP001        ADDRESS TEST>>
                        ;*******************************************************************************
                        ;*SUBTEST       MTP001  ADDRESS TEST
                        ;*******************************************************************************
026422  010220          3$:     MOV     R2,(R0)+        ;V177640
026424  062702  000002          ADD     #2,R2           ;V177642
026430  077104                  SOB     R1,3$           ;V177646
026432  000240                  NOP                     ;V177650
026434  012400          1$:     MOV     (R4)+,R0        ;V177652
026436  020005                  CMP     R0,R5           ;V177654
026440  001401                  BEQ     2$              ;V177656
026442  104427                  PERR01                  ;V177660
026444  062705  000002  2$:     ADD     #2,R5           ;V177662
026450  077307                  SOB     R3,1$           ;V177666
026452  000207                  RETURN                  ;V177672
026454                  MTP002: SUBTST  <<MTP002        COMPLEMENT ADDRESS TEST (WRITE DOWN, READ UP >>
                        ;*******************************************************************************
                        ;*SUBTEST       MTP002  COMPLEMENT ADDRESS TEST (WRITE DOWN, READ UP)
                        ;*******************************************************************************
026454  010540          3$:     MOV     R5,-(R0)        ;V177640
026456  062705  000002          ADD     #2,R5           ;V177642
026462  077104                  SOB     R1,3$           ;V177646
026464  000240                  NOP                     ;V177650
026466  162702  000002  1$:     SUB     #2,R2           ;V177652
026472  012401                  MOV     (R4)+,R1        ;V177656
026474  020102                  CMP     R1,R2           ;V177660
026476  001401                  BEQ     2$              ;V177662
026500  104430                  PERR02                  ;V177664
026502  077307          2$:     SOB     R3,1$           ;V177666
026504  000207                  RETURN                  ;V177670
```

```
 4451 026506                            MTPA03: SUBTST  <<MTPA03        3 XOR 9 WORST CASE NOISE TEST (WRITE)>>
                                        ;*********************************************************************
                                        ;*SUBTEST       MTPA03  3 XOR 9 WORST CASE NOISE TEST (WRITE)
                                        ;*********************************************************************
 4452                                           ;R0 = INTERLEAVE FACTOR
 4453                                           ;R1 = ADDRESS
 4454                                           ;R2 = SMALL LOOP CONSTANT
 4455                                           ;R3 = NUM OF ADD TO TEST (LARGE LOOP)
 4456                                           ;R4 = GOOD DATA
 4457                                           ;R5 = MEDIUM LOOP CONSTANT
 4458                                           .ENABL  LSB
 4459 026506  060001                    1$:     ADD     R0,R1           ;V177636 ADD INTERLEAVE FACTOR
 4460 026510  010421                            MOV     R4,(R1)+        ;V177640
 4461 026512  010421                            MOV     R4,(R1)+        ;V177642
 4462 026514  077204                            SOB     R2,1$           ;V177644
 4463 026516  005104                            COM     R4              ;V177646
 4464 026520  052704                            BIS     (PC)+,R4        ;V177650
 4465 026522  000401                    WARN2:  401                     ;V177652 WARNING LOCATION IS MODIFIED BEFORE LOADING
 4466 026524  012702  000004                    MOV     #4,R2           ;V177654
 4467 026530  077512                            SOB     R5,1$           ;V177660
 4468 026532  005104                            COM     R4              ;V177662
 4469 026534  052704                            BIS     (PC)+,R4        ;V177664
 4470 026536  000401                    WARN3:  401                     ;V177666 WARNING LOCATION IS MODIFIED BEFORE LOADING
 4471 026540  012705  000100                    MOV     #64.,R5         ;V177670
 4472 026544  077320                            SOB     R3,1$           ;V177674
 4473 026546  000207                            RETURN                  ;V177676
 4474                                           .DSABL  LSB
 4475
 4476 026550                            MTPB03: SUBTST  <<MTPB03        3 XOR 9 WORST CASE NOISE TEST (READ)>>
                                        ;*********************************************************************
                                        ;*SUBTEST       MTPB03  3 XOR 9 WORST CASE NOISE TEST (READ)
                                        ;*********************************************************************
 4477                                           .ENABL  LSB
 4478 026550  000137  172360            1$:     JMP     KDPAR0          ;V177640        GO TO V172360
 4479 026554  077203                            SOB     R2,1$           ;V177644
 4480 026556  005104                            COM     R4              ;V177646
 4481 026560  052704                            BIS     (PC)+,R4        ;V177650
 4482 026562  000401                    WARN4:  401                     ;V177652 WARNING LOCATION IS MODIFIED BEFORE LOADING
 4483 026564  012702  000004                    MOV     #4,R2           ;V177654
 4484 026570  077511                            SOB     R5,1$           ;V177660
 4485 026572  005104                            COM     R4              ;V177662
 4486 026574  052704                            BIS     (PC)+,R4        ;V177664
 4487 026576  000401                    WARN5:  401                     ;V177666 WARNING LOCATION IS MODIFIED BEFORE LOADING
 4488 026600  012705  000100                    MOV     #64.,R5         ;V177670
 4489 026604  077317                            SOB     R3,1$           ;V177674
 4490 026606  000207                            RETURN                  ;V177676
 4491                                           .DSABL  LSB
```

```
 4494 026610                          MTPC03: SUBTST  <<MTPC03        TEST DATA SUBPROGRAM>>
                                      ;*****************************************************************************
                                      ;*SUBTEST        MTPC03  TEST DATA SUBPROGRAM
                                      ;*****************************************************************************
 4495 026610  060001                          ADD     R0,R1           ;V172360
 4496 026612  020421                          CMP     R4,(R1)+        ;V172362
 4497 026614  001401                          BEQ     1$              ;V172364
 4498 026616  104431                          PERR03                  ;V172366
 4499 026620  005141                  1$:     COM     -(R1)           ;V172370
 4500 026622  005111                          COM     (R1)            ;V172372
 4501 026624  000137  172260                  JMP     SDPAR0          ;V174372        GO TO V172260
 4502
 4503 026630                          MTPD03: SUBTST  <<MTPD03        TEST DATA SUBSUBPROGRAM>>
                                      ;*****************************************************************************
                                      ;*SUBTEST        MTPD03  TEST DATA SUBSUBPROGRAM
                                      ;*****************************************************************************
 4504 026630  020421                          CMP     R4,(R1)+        ;V172260
 4505 026632  001401                          BEQ     1$              ;V172262
 4506 026634  104431                          PERR03                  ;V172264
 4507 026636  005127                  1$:     COM     (PC)+           ;V172266
 4508 026640  000000                          0                       ;V172270
 4509 026642  001033                          BNE     .+70            ;V172272        GO TO V172362
 4510 026644  000137  177644                  JMP     UIPAR2          ;V172274        GO TO V177644
```

```
                                MTPA04: SUBTST  <<MTPA04        ROTATING ZEROS TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTPA04  ROTATING ZEROS TEST
                                ;*****************************************************************************
4514 026650  012705  000010     1$:     MOV     #8.,R5          ;V177640
4515 026654  010504             1$:     MOV     R5,R4           ;V177644
4516 026656  000241             1$:     CLC                     ;V177646
4517 026660  000137  172360             JMP     KDPAR0  ;V177650
4518 026664  016004  177776             MOV     -2(R0),R4       ;V177654
4519 026670  103402             1$:     BCS     2$              ;V177660
4520 026672  020204             1$:     CMP     R2,R4           ;V177662
4521 026674  001401             1$:     BEQ     3$              ;V177664
4522 026676  104432             2$:     PERR04                  ;V177666
4523 026700  077115             3$:     SOB     R1,1$           ;V177670
4524 026702  000207             1$:     RETURN                  ;V177672
4525
4526 026704                     MTPB04: SUBTST  <<MTPB04        SUBR    ROTATING BIT>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTPB04  SUBR    ROTATING BIT
                                ;*****************************************************************************
4527 026704  106110             1$:     ROLB    (R0)            ;V172360
4528 026706  077502             1$:     SOB     R5,1$           ;V172362
4529 026710  106120             1$:     ROLB    (R0)+           ;V172364
4530 026712  106110             2$:     ROLB    (R0)            ;V172366
4531 026714  077402             1$:     SOB     R4,2$           ;V172370
4532 026716  106120             1$:     ROLB    (R0)+           ;V172372
4533 026720  000137  177654             JMP     UIPAR6          ;V172374
4534
4535 026724                     MTP005: SUBTST  <<MTP005        ROTATION ONES TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        MTP005  ROTATION ONES TEST
                                ;*****************************************************************************
4536 026724  012705  000010     1$:     MOV     #8.,R5          ;V177640
4537 026730  010504             1$:     MOV     R5,R4           ;V177644
4538 026732  000261             1$:     SEC                     ;V177646
4539 026734  000137  172360             JMP     KDPAR0  ;V177650
4540 026740  016004  177776             MOV     -2(R0),R4       ;V177654
4541 026744  103002             1$:     BCC     2$              ;V177660 IF THIS HAPPENS THE GOOD & BAD MATCH
4542 026746  020204             1$:     CMP     R2,R4           ;V177662
4543 026750  001401             1$:     BEQ     3$              ;V177664
4544 026752  104432             2$:     PERR04                  ;V177666
4545 026754  077115             3$:     SOB     R1,1$           ;V177670
4546 026756  000207             1$:     RETURN                  ;V177672
```

```
 4550 026760                                MTP006: SUBTST  <<MTP006        INITIAL DATA TEST>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        MTP006  INITIAL DATA TEST
                                            ;*****************************************************************************
 4551                                                       ;       THIS TEST CHECKS THE DI/DO LINES BY
 4552                                                       ;       SHIFTING A 1 THROUGH THE WORD.
 4553 026760  012737  000001  002340          MOV     #1,DATBUF       ;SET THE FIRST TEST BIT
 4554 026766  005037  002342                  CLR     DATBUF+2        ;CLEAR 2ND WORD
 4555 026772  013711  002340          1$:     MOV     DATBUF,(R1)     ;WRITE TEST WORD 1
 4556 026776  013761  002342  000002          MOV     DATBUF+2,2(R1)  ;AND TEST WORD 2
 4557 027004  011102                          MOV     (R1),R2
 4558 027006  023702  002340                  CMP     DATBUF,R2       ;NOW READ THEM
 4559 027012  001401                          BEQ     2$              ;BR IF FIRST 16 OK
 4560 027014  104433                          PERR07                  ;ERROR TRAP
 4561
 4562 027016  016102  000002          2$:     MOV     2(R1),R2
 4563 027022  023702  002342                  CMP     DATBUF+2,R2     ;NOW READ SECOND WORD
 4564 027026  001401                          BEQ     3$              ;BR IF OK
 4565 027030  104434                          PERR10                  ;ERROR TRAP
 4566
 4567 027032  005737  002342          3$:     TST     DATBUF+2        ;HAS LAST BIT BEEN TESTED ?
 4568 027036  100405                          BMI     4$              ;MINUS MEANS BIT 31
 4569 027040                                  DLEFT   DATBUF          ;NO, SHIFT TEST BIT LEFT
      027040  006137  002340                  ROL     DATBUF
      027044  006137  002342                  ROL     DATBUF+2
                                             .DSABL  CRF
 4570 027050  000750                          BR      1$              ;GO WRITE NEW TEST DATA
 4571                                                                 ;NOW GOING TO SHIFT A 0 IN DATA DIRECTION
 4572 027052  012737  177776  002340  4$:     MOV     #177776,DATBUF  ;PUT A 0 IN BIT 0
 4573 027060  012737  177777  002342          MOV     #-1, DATBUF+2   ;AND 1'S IN ALL OTHERS
 4574 027066  013711  002340          5$:     MOV     DATBUF,(R1)     ;WRITE THE DATA
 4575 027072  013761  002342  000002          MOV     DATBUF+2,2(R1)  ;2 WORDS WORTH
 4576 027100  011102                          MOV     (R1),R2
 4577 027102  023702  002340                  CMP     DATBUF,R2       ;NOW READ FIRST WORD
 4578 027106  001401                          BEQ     6$              ;BR IF OK
 4579 027110  104433                          PERR07
 4580
 4581 027112  016102  000002          6$:     MOV     2(R1),R2
 4582 027116  023702  002342                  CMP     DATBUF+2,R2     ;NOW, READ SECOND WORD
 4583 027122  001401                          BEQ     7$              ;BR IF OK
 4584 027124  104434                          PERR10
 4585
 4586 027126  005737  002342          7$:     TST     DATBUF+2        ;TESTED BIT 31 YET?
 4587 027132  100005                          BPL     8$              ;BR IF YES, WE'RE DONE
 4588 027134                                  DLEFT   DATBUF
      027134  006137  002340                  ROL     DATBUF
      027140  006137  002342                  ROL     DATBUF+2
                                             .DSABL  CRF
 4589 027144  000750                          BR      5$              ;KEEP GOING
 4590 027146  000207                  8$.     RETURN
```

```
 4594 027150                        MTP007: SUBTST  <<MTP007        ADDRESS BIT TEST>>
                                    ;*****************************************************************************
                                    ;*SUBTEST        MTP007  ADDRESS BIT TEST
                                    ;*****************************************************************************
 4595                                               ;       THIS TEST CHECKS TO SEE THAT EACH ADDRESS
 4596                                               ;       BIT IN EACH 16K BANK CAN BE ASSERTED UNIQUELY.
 4597                                               ;       IT CHECKS FOR ADDRESS BITS THAT MAY BE STUCK
 4598                                               ;       HIGH, STUCK LOW OR STUCK TOGETHER.
 4599 027150  111100                        MOVB    (R1),R0
 4600 027152  105700                        TSTB    R0              ;READ AND COMPARE FOR ZEROS
 4601 027154  001401                        BEQ     1$              ;BR IF OK
 4602 027156  104435                        PERR11
 4603
 4604 027160  105111                1$:     COMB    (R1)            ;COMPLEMENT THE BYTE
 4605 027162  111100                        MOVB    (R1),R0
 4606 027164  105700                        TSTB    R0              ;READ FOR NON ZEROS
 4607 027166  001001                        BNE     2$              ;BR IF OK
 4608 027170  104436                        PERR12
 4609
 4610 027172  040201                2$:     BIC     R2,R1           ;MASK OFF THE ASSERTED BIT
 4611 027174  006302                        ASL     R2              ;SHIFT R2 FOR NEXT BIT
 4612 027176  050201                        BIS     R2,R1           ;SET THE NEW BIT INTO R1
 4613 027200  011100                        MOV     (R1),R0
 4614 027202  005700                        TST     R0              ;READ THE NEW ADDRESS
 4615 027204  001401                        BEQ     3$              ;READ FOR ZEROS
 4616 027206  104437                        PERR13
 4617
 4618 027210  005111                3$:     COM     (R1)            ;COMPL THE WORD
 4619 027212  011100                        MOV     (R1),R0
 4620 027214  005700                        TST     R0              ;READ IT AGAIN
 4621 027216  001001                        BNE     4$
 4622 027220  104440                        PERR14
 4623
 4624 027222  022702  100000        4$:     CMP     #100000,R2
 4625 027226  001407                        BEQ     5$
 4626 027230  022702  010000                CMP     #10000,R2       ;CHECK FOR MSB IN 4K BANK
 4627 027234  001356                        BNE     2$              ;NOT LAST BIT, BRANCH
 4628 027236  006302                        ASL     R2
 4629 027240  012701  160000                MOV     #160000,R1
 4630 027244  000752                        BR      2$
 4631 027246  000207                5$:     RETURN
```

```
 4634 027250                            MTP010: SUBTST  <<MTP010        BYTE ADDRESSING TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP010  BYTE ADDRESSING TEST
                                        ;*****************************************************************************
 4635                                                   ;TEST 3 THIS TEST CHECKS FOR PROPER
 4636                                                   ;       BYTE ADDRESSING WITH ECC DISABLED
 4637 027250  010402                            MOV     R4,R2           ;R4 HAS LOWEST ADDRESS
 4638 027252  010403                            MOV     R4,R3           ;PUT IT IN R3 ALSO
 4639 027254  062702  000004                    ADD     #4,R2           ;POINT R2 TO LAST BYTE +1
 4640 027260  012713  177777                    MOV     #-1,(R3)        ;WRITE ALL ONES IN
 4641 027264  012763  177777  000002            MOV     #-1,2(R3)       ;THE 4 TEST BYTES
 4642 027272  105013                    1$:     CLRB    (R3)            ;CLEAR A BYTE
 4643 027274  010401                            MOV     R4,R1           ;INITIALIZE R1 FOR EACH PASS
 4644 027276  020201                    2$:     CMP     R2,R1           ;IF EQUAL, JUST READ LAST BYTE
 4645 027300  001420                            BEQ     6$              ;BR IF EQUAL
 4646 027302  020301                            CMP     R3,R1           ;IS THIS THE BYTE OF ZEROS
 4647 027304  001007                            BNE     4$              ;BR IF NOT
 4648 027306  111100                            MOVB    (R1),R0
 4649                                           ;WARNING IF YOU OPTOMIZE CHANGE THE PCBUMP FOR THIS ERROR INCASE OF TRAPS
 4650 027310  022700  000000                    CMP     #0,R0           ;IT IS, COMPARE FOR ZEROS
 4651 027314  001401                            BEQ     3$
 4652 027316  104435                            PERR11
 4653
 4654 027320  005201                    3$:     INC     R1              ;NEXT BYTE
 4655 027322  000765                            BR      2$              ;RETURN
 4656 027324  111100                    4$:     MOVB    (R1),R0
 4657 027326  122700  177777                    CMPB    #-1,R0          ;ITS NOT THE BYTE OF 0'S, READ 1'S
 4658 027332  001401                            BEQ     5$
 4659 027334  104436                            PERR12
 4660
 4661 027336  005201                    5$:     INC     R1              ;MOVE TO NEXT BYTE
 4662 027340  000756                            BR      2$
 4663 027342  112713  177777            6$:     MOVB    #-1,(R3)        ;RESTORE 1'S TO BYTE JUST TESTED
 4664 027346  005203                            INC     R3              ;INC TO NEXT BYTE
 4665 027350  020302                            CMP     R3,R2           ;WAS THAT JUST THE LAST ONE?
 4666 027352  001347                            BNE     1$              ;BR IF NO
 4667 027354  000207                            RETURN
```

```
 4671 027356                            MTP011: SUBTST  <<MPT011        SINGLE BIT ERROR TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST       MPT011  SINGLE BIT ERROR TEST
                                        ;*********************************************************************
 4672                                           ;(1)    CREATE A SINGLE BIT ERROR
 4673                                           ;
 4674                                           ;(2)    READ BACK SBE UNCORRECTED (WITH ECC DISABLE)
 4675                                           ;
 4676                                           ;(3)    ENABLE ECC & READ CORRECTED DATA
 4677                                           ;
 4678                                           ;(4)    CHECK THAT THE SBE FLAG WAS SET FORM THE LAST READ
 4679                                           ;
 4680                                           ;(5)    DO (1-4) FOR DATA CONSISTING OF 1 BIT SET IN EACH OF 32
 4681                                           ;       POSITIONS OF A DOUBLE WORD
 4682                                           ;       THEN DO IT AGAIN FOR 1 BIT CLEARED IN EACH OF 32 POSITIONS OF
 4683                                           ;       A DOUBLE WORD
 4684                                           ;       IE (64 TIMES)
 4685                                           ;
 4686                                           ;(6)    DO (1-5) FOR A SBE IN EACH OF 32 BIT POSITIONS
 4687                                           ;       IE (RUN TEST 64 * 32 = 2048 TIMES)
 4688 027356  104503                           CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4689                                           ;BIG LOOP
 4690 027360  012737  000001  002340  1$:      MOV     #1,DATBUF       ;INITIAL DATA
 4691 027366  005037  002342                   CLR     DATBUF+2        ;32 BITS WORTH
 4692                                           ;MEDIUM LOOP
 4693 027372  012737  000001  002350  2$:      MOV     #1,SBEMSK       ;INITIAL ERROR MASK
 4694 027400  005037  002352                   CLR     SBEMSK+2        ;32 BITS WORTH
 4695                                           ;LITTLE LOOP
 4696 027404  013737  002340  002344  3$:      MOV     DATBUF,TSTDAT   ;
 4697 027412  013737  002342  002346           MOV     DATBUF+2,TSTDAT+2;TO SAVE ORIG DATA
 4698 027420  105737  002362                   TSTB    PASFLG  ;COMP DATA ON SECOND PASSONLY
 4699 027424  001404                           BEQ     4$              ;BR IF FIRST PASS
 4700 027426  005137  002344                   COM     TSTDAT          ;SECOND PASS, COMP BOTH WORDS
 4701 027432  005137  002346                   COM     TSTDAT+2
 4702 027436  013702  002344           4$:     MOV     TSTDAT,R2
 4703 027442  013703  002346                   MOV     TSTDAT+2,R3
 4704 027446  012737  002344  002402           MOV     #TSTDAT,SOURCE  ;SET UP ADDRESS FOR CHKGEN
 4705 027454  004737  040540                   CALL    CHKGEN          ;GEN CHECKBITS ON TSTDAT
 4706                                           ;*******************************
 4707                                           ;** CREATE A SINGLE BIT ERROR **
 4708                                           ;*******************************
 4709 027460  013701  002350                   MOV     SBEMSK,R1
 4710 027464  074137  002344                   XOR     R1,TSTDAT
 4711 027470  013701  002352                   MOV     SBEMSK+2,R1
 4712 027474  074137  002346                   XOR     R1,TSTDAT+2
 4713 027500  013701  002506           5$:     MOV     TESTADD,R1      ;FIRST TEST ADDRESS
 4714 027504  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4715 027506  013721  002344                   MOV     TSTDAT,(R1)+    ;WRITE FIRST 16 BITS
 4716 027512  104475                           CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELF TED CSR
 4717 027514  013711  002346                   MOV     TSTDAT+2,(R1)   ;WRITE SECOND 16 BITS AND
 4718                                                                   ;CHECK BITS. WE NOW HAVE CHECKBITS
 4719                                                                   ;GENERATED ON DATBUF AND DATA WITH
 4720                                                                   ;ONE BIT IN ERROR (AS PER SBEMSK).
 4721 027520  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4722 027522  014100                           MOV     -(R1),R0
 4723 027524  020037  002344                   CMP     R0,TSTDAT       ;READ THE LOW WORD (UNCORRECTED)
 4724 027530  001401                           BEQ     6$              ;BR IF OK
```

```
 4725 027532  104455                          PERR31
 4726
 4727 027534  062701  000002          6$:     ADD     #2,R1           ;POINT R1 TO SECOND 16 BITS
 4728 027540  011100                          MOV     (R1),R0
 4729 027542  020037  002346                  CMP     R0,TSTDAT+2     ;READ THE HIGH WORD (UNCORRECTED)
 4730 027546  001401                          BEQ     7$              ;BR IF OK
 4731 027550  104455                          PERR31
 4732
 4733 027552  104503                  7$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4734 027554  014100                          MOV     -(R1),R0
 4735 027556  020002                          CMP     R0,R2           ;SEE IF ITS BEEN CORRECTED
 4736 027560  001401                          BEQ     8$              ;IT SHOULD HAVE BEEN
 4737 027562  104456                          PERR32
 4738
 4739 027564  104510                  8$:     TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 4740 027566  103411                          BCS     9$              ;BR IF IT IS SET
 4741 027570                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
      027570  012737  177777  002724                                                          MOV  #-1,HEADER
 4742 027576  010137  002040                  MOV     R1,ADDRESS
 4743 027602  104460                          PERR34
 4744 027604                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
      027604  012737  177777  002724                                                          MOV  #-1,HEADER
 4745
 4746 027612  104503                  9$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4747 027614  062701  000002                  ADD     #2,R1           ;POINT TO HIGH WORD
 4748 027620  011100                          MOV     (R1),R0
 4749 027622  020003                          CMP     R0,R3           ;SEE IF ITS BEEN CORRECTED
 4750 027624  001401                          BEQ     10$             ;BR IF OK
 4751 027626  104456                          PERR32
 4752
 4753 027630  104510                  10$:    TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
 4754 027632  103411                          BCS     11$             ;BR IF YES
 4755 027634                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
      027634  012737  177777  002724                                                          MOV  #-1,HEADER
 4756 027642  010137  002040                  MOV     R1,ADDRESS
 4757 027646  104460                          PERR34
 4758 027650                                  SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
      027650  012737  177777  002724                                                          MOV  #-1,HEADER
 4759 027656  005737  002352          11$:    TST     SBEMSK+2        ;TEST FOR LAST MASK BIT
 4760 027662  100405                          BMI     12$             ;MINUS MEANS BIT 31
 4761 027664                                  DLEFT   SBEMSK
      027664  006137  002350                  ROL     SBEMSK
      027670  006137  002352                  ROL     SBEMSK+2
                                               .DSABL  CRF
 4762 027674  000643                          BR      3$
 4763 027676                          12$:    IF #SW11 SET.IN @SWR THEN GOTO 13$
      027676  032777  004000  153062                                                          BIT  #SW11,@SWR
      027704  001013                                                                        BNE  13$
 4764 027706                                  IF QVFLAG IS TRUE THEN GOTO 13$
      027706  005737  002440                                                              TST  QVFLAG
      027712  001010                                                                        BNE  13$
 4765 027714  005737  002342                  TST     DATBUF+2        ;LAST DATA BIT ?
 4766 027720  100405                          BMI     13$             ;WHICH IS BIT 31
 4767 027722                                  DLEFT   DATBUF
      027722  006137  002340                  ROL     DATBUF
      027726  006137  002342                  ROL     DATBUF+2
                                               .DSABL  CRF
```

```
 4768 027732  000617                        BR      2$
 4769 027734  105737  002362          13$:   TSTB    PASFLG  ;FIRST OR SECOND PASS ?
 4770 027740  001003                        BNE     14$             ;NON ZERO MEANS WE'RE DONE
 4771 027742  105237  002362                INCB    PASFLG  ;NOT DONE, GO DO SECOND PASS
 4772 027746  000604                        BR      1$
 4773                                       ;CLEAR OUT ANY DBE'S OR SBE'S
 4774 027750  104471                 14$:   ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4775 027752  013701  002506                MOV     TESTADD,R1
 4776 027756                                CLEAR   (R1)+,(R1)
      027756  005021                                                                    CLR   (R1)+
      027760  005011                                                                    CLR   (R1
 4777 027762  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4778 027764  000207                        RETURN
```

```
                                        MTP012: SUBTST  <<MTP012        WRITE BYTE CLEARS SBE TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP012  WRITE BYTE CLEARS SBE TEST
                                        ;*****************************************************************************
                                                        ;SINGLE BIT ERROR TEST TO INSURE THAT A WRITE
                                                        ;BYTE CLEARS SINGLE BIT ERRORS.
027766  104503                                  CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
027770  012737  000001  002340                  MOV     #1,DATBUF       ;INITIAL DATA
027776  005037  002342                          CLR     DATBUF+2        ;32 BITS WORTH
030002  012737  000001  002350          1$:     MOV     #1,SBEMSK       ;INITIAL ERROR MASK
030010  005037  002352                          CLR     SBEMSK+2        ;32 BITS WORTH
030014  013737  002340  002344          2$:     MOV     DATBUF,TSTDAT   ;SAVE ORIGINAL DATA
030022  013737  002342  002346                  MOV     DATBUF+2,TSTDAT+2;BOTH WORDS
030030  012737  002344  002402                  MOV     #TSTDAT,SOURCE  ;NEED ADDRESS FOR CHKGEN
030036  004737  040540                          CALL    CHKGEN          ;GENERATE CHECK BITS
030042  013701  002350                          MOV     SBEMSK,R1
030046  074137  002344                          XOR     R1,TSTDAT
030052  013701  002352                          MOV     SBEMSK+2,R1
030056  074137  002346                          XOR     R1,TSTDAT+2
030062  013704  002506                  3$:     MOV     TESTADD,R4      ;FIRST TEST ADDRESS
030066  010401                                  MOV     R4,R1           ;PUT IT IN R1 ALSO
030070  104471                                  ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
030072  013721  002344                          MOV     TSTDAT,(R1)+    ;WRITE 16 BITS
030076  104475                                  CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
030100  013711  002346                          MOV     TSTDAT+2,(R1)   ;WRITE HIGH WORD+CHECKBITS
030104  104503                                  CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
                                                        ;IT'S DANGEROUS IF WE DON'T
030106  012702  002350                          MOV     #SBEMSK,R2      ;ADDRESS OF ERROR MASK
030112  162701  000002                          SUB     #2,R1           ;ADJUST ADDRESS
030116  112711  177777                  4$:     MOVB    #-1,(R1)        ;WRITE A BYTE OF 1'S
030122  132712  177777                          BITB    #-1,(R2)        ;DID THIS BYTE HAVE THE BAD BIT IN IT?
030126  001420                                  BEQ     6$              ;NO - BRANCH
030130  104510                                  TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
030132  103011                                  BCC     5$              ;NO - SKIP
030134                                          SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
030134  012737  177777  002724                                                          MOV  #-1,HEADER
030142  010137  002040                          MOV     R1,ADDRESS
030146  104017                                  ERROR   +17
030150                                          SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
030150  012737  177777  002724                                                          MOV  #-1,HEADER

030156  111100                          5$:     MOVB    (R1),R0
030160  122700  177777                          CMPB    #-1,R0          ;CHECK DATA
030164  001414                                  BEQ     7$              ;BR IF OK
030166  104457                                  PERR33

030170  104510                          6$:     TSTREAD                 ;TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES)
                                                        ;READ THE BYTE
                                                        ;SBE ERROR BIT ONLY SET ?
030172  103771                                  BCS     5$              ;SHOULD BE SET, BR IF OK
030174                                          SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
030174  012737  177777  002724                                                          MOV  #-1,HEADER
030202  010137  002040                          MOV     R1,ADDRESS
030206  104460                                  PERR34
030210                                          SET     HEADER          ;ENABLE PRINTING OF ERROR HEADER INFO
030210  012737  177777  002724                                                          MOV  #-1,HEADER
```

```
4832 030214  132712  177777          7$:     BITB    #-1,(R2)            ;CHECK FOR LAST BYTE
4833 030222  001012                          BNE     8$                  ;
4834 030224  005202                          INC     R2
4835 030226  005201                          INC     R1                  ;MOVE   TO      NEXT BYTE
4836 030230  013704  002506                  MOV     TESTADD,R4          ,FIRST TEST ADDRESS
4837 030234  032701  000002                  BIT     #2,R1               ;TEST FOR LOWER WORD
4838 030240  001726                          BEQ     4$                  ;BR IF IT'S LOW 16 BITS
4839 030242  062704  000002                  ADD     #2,R4               ;ADJUST POINTER FOR ERROR REPT.
4840 030246  000723                          BR      4$
4841 030250  005737  002352          8$:     TST     SBEMSK+2            ;LAST ERROR BIT ?
4842 030254  100405                          BMI     9$                  ;MINUS MEANS BIT 31
4843 030256                                  DLEFT   SBEMSK
     030256  006137  002350                  ROL     SBEMSK
     030262  006137  002352                  ROL     SBEMSK+2
                                             .DSABL  CRF
4844 030266  000652                          BR      2$
4845 030270                          9$:     IF #SW11 SET.IN @SWR THEN GOTO 10$
     030270  032777  004000  152470                                                     BIT #SW11,@SWR
     030276  001013                                                                     BNE 10$
4846 030300                                  IF QVFLAG IS TRUE THEN GOTO 10$
     030300  005737  002440                                                             TST QVFLAG
     030304  001010                                                                     BNE 10$
4847 030306  005737  002342                  TST     DATBUF+2            ;LAST DATA BIT?
4848 030312  100405                          BMI     10$                 ;MINUS = BIT 31
4849 030314                                  DLEFT   DATBUF
     030314  006137  002340                  ROL     DATBUF
     030320  006137  002342                  ROL     DATBUF+2
                                             .DSABL  CRF
4850 030324  000626                          BR      1$
4851                                         ;CLEAR OUT ANY DBE'S OR SBE'S
4852 030326  104471                  10$:    ECC1DIS                     ;DISABLE ECC ON 1 SELECTED CSR
4853 030330  013701  002506                  MOV     TESTADD,R1
4854 030334                                  CLEAR   (R1)+,(R1)
     030334  005021                                                                     CLR   (R1)+
     030336  005011                                                                     CLR   (R1)
4855 030340  104503                          CLR1CSR                     ;CLEAR 1 SELECTED MK11 CSR
4856 030342  000207                          RETURN
```

```
 4860 030344                            MTP013: SUBTST  <<MTP013        CREATE DOUBLE BIT ERROR TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP013  CREATE DOUBLE BIT ERROR TEST
                                        ;*****************************************************************************
 4861                                                   ;DOUBLE BIT ERROR FORCE TO CHECK DOUBLE ERROR LOGIC
 4862 030344  104503                            CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4863 030346  013701  002506                    MOV     TESTADD,R1
 4864 030352  005037  002340            1$.     CLR     DATBUF          ;MAKE INITIAL DATA
 4865 030356  005037  002342                    CLR     DATBUF+2        ;ALL ZEROS
 4866 030362  012737  000001  002350    2$:     MOV     #1,SBEMSK       ;INITIAL SINGLE ERROR MASK
 4867 030370  005037  002352                    CLR     SBEMSK+2        ;SECOND WORD
 4868 030374  012737  000001  002354    3$:     MOV     #1,DBEMSK       ;INITIAL DOUBLE ERROR MASK
 4869 030402  005037  002356                    CLR     DBEMSK+2        ;32 BITS HERE ALSO
 4870 030406  013737  002340  002344    4$:     MOV     DATBUF,TSTDAT   ;
 4871 030414  013737  002342  002346            MOV     DATBUF+2,TSTDAT+2
 4872 030422  105737  002362                    TSTB    PASFLG  ;NO COMPLEMENTING FIRST PASS
 4873 030426  001404                            BEQ     5$
 4874 030430  005137  002344                    COM     TSTDAT          ;COMP FIRST WORD
 4875 030434  005137  002346                    COM     TSTDAT+2        ;SECOND WORD
 4876 030440  104503                    5$:     CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4877 030442  023737  002350  002354            CMP     SBEMSK,DBEMSK   ;CAN'T HAVE THE SAME ERROR BIT SET
 4878 030450  001004                            BNE     6$              ;IN BOTH MASKS
 4879 030452  023737  002352  002356            CMP     SBEMSK+2,DBEMSK+2;COULD BE EQUAL IN SECOND WORD
 4880 030460  001452                            BEQ     9$              ;GO MAKE THEM NOT EQUAL
 4881 030462  012737  002344  002402    6$:     MOV     #TSTDAT,SOURCE  ;SOURCE ADDRESS FOR CHKGEN
 4882 030470  004737  040540                    CALL    CHKGEN          ;GO GENERATE CHECK BITS
 4883 030474  013702  002350                    MOV     SBEMSK,R2
 4884 030500  074237  002344                    XOR     R2,TSTDAT
 4885 030504  013702  002352                    MOV     SBEMSK+2,R2
 4886 030510  074237  002346                    XOR     R2,TSTDAT+2
 4887 030514  013702  002354                    MOV     DBEMSK,R2
 4888 030520  074237  002344                    XOR     R2,TSTDAT
 4889 030524  013702  002356                    MOV     DBEMSK+2,R2
 4890 030530  074237  002346                    XOR     R2,TSTDAT+2
 4891 030534  104471                            ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4892 030536  013721  002344                    MOV     TSTDAT,(R1)+    ;WRITE 16 BITS
 4893 030542  104475                            CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 4894 030544  013711  002346                    MOV     TSTDAT+2,(R1)   ;WRITE HIGH WORD
 4895 030550  104503                            CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4896 030552  162701  000002                    SUB     #2,R1           ;ADJUST TEST ADDRESS
 4897 030556  005711                            TST     (R1)            ;READ THE LOCATION
 4898 030560  104501                            WAS1DBE                 ;WAS THERE ANY DOUBLE BIT ERRORS ON 1 SELECTED CSR
 4899 030562  103411                            BCS     9$              ;IT SHOULD BE SET
 4900 030564                                    SET     HEADER
      030564  012737  177777  002724                                                    MOV  #-1,HEADER
 4901 030572  010137  002040                    MOV     R1,ADDRESS
 4902 030576  104030                            ERROR   +30
 4903 030600                                    SET     HEADER
      030600  012737  177777  002724                                                    MOV  #-1,HEADER
```

```
 4906 030606  005737  002356          9$:     TST     DBEMSK+2        ;CHECK MASK FOR LAST BIT
 4907 030612  100405                          BMI     10$             ;MINUS = BIT31
 4908 030614                                  DLEFT   DBEMSK
      030614  006137  002354                  ROL     DBEMSK
      030620  006137  002356                  ROL     DBEMSK+2
                                               .DSABL  CRF
 4909 030624  000670                          BR      4$
 4910 030626                          10$:    IF #SW11 SET.IN @SWR THEN GOTO 11$
      030626  032777  004000  152132                                                  BIT #SW11,@SWR
      030634  001013                                                                  BNE 11$
 4911 030636                                  IF QVFLAG IS TRUE THEN GOTO 11$
      030636  005737  002440                                                        TST QVFLAG
      030642  001010                                                                BNE 11$
 4912 030644  005737  002352                  TST     SBEMSK+2        ;CHECK SINGLE ERROR MASK TOO
 4913 030650  100405                          BMI     11$             ;BR IF DONE
 4914 030652                                  DLEFT   SBEMSK
      030652  006137  002350                  ROL     SBEMSK
      030656  006137  002352                  ROL     SBEMSK+2
                                               .DSABL  CRF
 4915 030662  000644                          BR      3$
 4916 030664  105737  002362          11$:    TSTB    PASFLG  ;FIRST PASS
 4917 030670  001003                          BNE     12$             ;NON ZERO MEANS WE'RE DONE
 4918 030672  105237  002362                  INCB    PASFLG  ;FIRST PASS, NOT DONE
 4919                                         ;CLEAR OUT ANY DBE'S OR SBE'S
 4920 030676  000625                          BR      1$              ;KEEP GOING
 4921 030700  104471                  12$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 4922 030702  013701  002506                  MOV     TESTADD,R1
 4923 030706                                  CLEAR   (R1)+,(R1)
      030706  005021                                                                CLR  (R1)+
      030710  005011                                                                CLR  (R1)
 4924 030712  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 4925 030714  000207                          RETURN
```

```
 4929 030716                                MTP014: SUBTST  <<MTP014        WRITE INHIBIT DURING DATIP WITH DBE TEST>>
                                            ;*********************************************************************
                                            ;*SUBTEST       MTP014  WRITE INHIBIT DURING DATIP WITH DBE TEST
                                            ;*********************************************************************
 4930                                                       ;THIS TEST CHECKS THE WRITE INHIBIT ON DOUBLE
 4931                                                       ;BIT ERRORS DURING A DATIP OPERATION BY USE
 4932                                                       ;OF AN 'ASRB' INSTRUCTION.
 4933                                                       ;
 4934                                                       ;NOTE:  THIS IS ONLY A USEFULL TEST ON PDP11/70 WITH THE MULTIPORT ECO
 4935                                                       ;IE THOSE THAT DO A DATIP ON THE ASRB (LOCK) INSTRUCTION.
 4936 030716  005037  002340          1$:      CLR      DATBUF             ;INITIAL DATA
 4937 030722  005037  002342                   CLR      DATBUF+2           ;2 WORDS WORTH
 4938 030726  012737  000001  002350  2$:      MOV      #1,SBEMSK          ;INITIAL ERROR MASK
 4939 030734  005037  002352                   CLR      SBEMSK+2           ;
 4940 030740  012737  000001  002354  3$:      MOV      #1,DBEMSK          ;DOUBLE ERROR MASK
 4941 030746  005037  002356                   CLR      DBEMSK+2           ;2 WORDS
 4942 030752  013737  002340  002344  4$:      MOV      DATBUF,TSTDAT      ;PRESERVE ORIG DATA
 4943 030760  013737  002342  002346           MOV      DATBUF+2,TSTDAT+2
 4944 030766  105737  002362                   TSTB     PASFLG  ;SECOND PASS YET ?
 4945 030772  001404                           BEQ      5$                 ;BR IF NO
 4946 030774  005137  002344                   COM      TSTDAT             ;COMPL DATA  ON SECOND PASS
 4947 031000  005137  002346                   COM      TSTDAT+2
 4948 031004  104503                 5$:      CLR1CSR                     ;CLEAR 1 SELECTED MK11 CSR
 4949 031006  023737  002354  002350           CMP      DBEMSK,SBEMSK      ;CHECK FOR SAME MASKS
 4950 031014  001004                           BNE      6$                 ;BR IF OK
 4951 031016  023737  002356  002352           CMP      DBEMSK+2,SBEMSK+2
 4952 031024  001466                           BEQ      11$                ;BR IF THEY'RE EQUAL
 4953 031026  012737  002344  002402  6$:      MOV      #TSTDAT,SOURCE     ;SET UP ADDRESS FOR CHKGEN
 4954 031034  004737  040540                   CALL     CHKGEN             ;GENERATE CHECK BITS
 4955 031040  013701  002350                   MOV      SBEMSK,R1
 4956 031044  074137  002344                   XOR      R1,TSTDAT
 4957 031050  013701  002352                   MOV      SBEMSK+2,R1
 4958 031054  074137  002346                   XOR      R1,TSTDAT+2
 4959 031060  013701  002354                   MOV      DBEMSK,R1
 4960 031064  074137  002344                   XOR      R1,TSTDAT
 4961 031070  013701  002356                   MOV      DBEMSK+2,R1
 4962 031074  074137  002346                   XOR      R1,TSTDAT+2
 4963 031100  013701  002506          7$:      MOV      TESTADD,R1         ;TEST ADDRESS
 4964 031104  104471                           ECC1DIS                     ;DISABLE ECC ON 1 SELECTED CSR
 4965 031106  013721  002344                   MOV      TSTDAT,(R1)+       ;WRITE FIRST 16 BITS
 4966 031112  104475                           CB1CSR                      ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 4967 031114  013711  002346                   MOV      TSTDAT+2,(R1)      ;SECOND 16 BITS+CHECKBITS
 4968 031120  105037  002363                   CLRB     UPPFLG             ;INDICATE LOWER WORD
 4969 031124  013703  002506                   MOV      TESTADD,R3         ;TEST ADDRESS
 4970 031130  104503                 8$:      CLR1CSR                     ;CLEAR 1 SELECTED MK11 CSR
 4971 031132  106223                           ASRB     (R3)+              ;SPECIAL DATIP INSTRUCTION
 4972 031134  014100                           MOV      -(R1),R0
 4973 031136  023700  002344                   CMP      TSTDAT,R0          ;CHECK FOR UNCHANGED DATA
 4974 031142  001401                           BEQ      9$                 ;SHOULD BE UNCHANGED
 4975 031144  104455                           PERR31
 4976
 4977 031146  062701  000002          9$:      ADD      #2,R1              ;POINT TO UPPER WORD
 4978 031152  011100                           MOV      (R1),R0
 4979 031154  023700  002346                   CMP      TSTDAT+2,R0        ;READ IT
 4980 031160  001401                           BEQ      10$                ;BR IF UNCHANGED
 4981 031162  104455                           PERR31
 4982
```

```
 4983 031164  12?737  000003  002363  10$:    CMPB    #3,UPPFLG               ;LOWER WORD
 4984 031172  001403                          BEQ     11$             ;BR IF NO
 4985 031174  105237  002363                  INCB    UPPFLG
 4986 031200  000753                          BR      8$
 4987 031202  005737  002356          11$:    TST     DBEMSK+2        ;LAST BIT IN MASK ?
 4988 031206  100405                          BMI     12$             ;BR IF BIT 31
 4989 031210                                   DLEFT   DBEMSK
      031210  006137  002354                  ROL     DBEMSK
      031214  006137  002356                  ROL     DBEMSK+2
                                              .DSABL  CRF
 4990 031220  000654                          BR      4$
 4991 031222                          12$:    IF #SW11 SET.IN @SWR THEN GOTO 13$
      031222  032777  004000  151536                                                  BIT #SW11,@SWR
      031230  001013                                                                  BNE 13$
 4992 031232                                   IF QVFLAG IS TRUE THEN GOTO 13$
      031232  005737  002440                                                        TST QVFLAG
      031236  001010                                                                BNE 13$
 4993 031240  005737  002352                  TST     SBEMSK+2        ;LAST BIT IN SINGLE ERROR MASK ?
 4994 031244  100405                          BMI     13$             ;BR IF YES
 4995 031246                                   DLEFT   SBEMSK
      031246  006137  002350                  ROL     SBEMSK
      031252  006137  002352                  ROL     SBEMSK+2
                                              .DSABL  CRF
 4996 031256  000630                          BR      3$
 4997 031260  105737  002362          13$:    TSTB    PASFLG  ;WHICH PASS
 4998 031264  001003                          BNE     14$             ;BR IF WE'RE DONE
 4999 031266  105237  002362                  INCB    PASFLG  ;INDICATE SECOND PASS COMING
 5000                                         ;CLEAR OUT ANY DBE'S OR SBE'S
 5001 031272  000611                          BR      1$              ;GO DO IT!
 5002 031274  104471                  14$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5003 031276  013701  002506                  MOV     TESTADD,R1
 5004 031302                                   CLEAR   (R1)+,(R1)
      031302  005021                                                                CLR   (R1)+
      031304  005011                                                                CLR   (R1)
 5005 031306  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 5006 031310  000207                          RETURN
```

```
5010 031312                                MTP015: SUBTST  <<MTP015        WRITE INHIBIT OF BYTE WITH DBE>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       MTP015  WRITE INHIBIT OF BYTE WITH DBE
                                           ;*****************************************************************************
5011                                                       ;CHECK FOR WRITE INHIBIT DURING A WRITE BYTE.
5012                                                       ;CHECKS FOR UNCORRECTED DATA.
5013 031312  005037  002340          1$:       CLR       DATBUF              ;INITIAL DATA
5014 031316  005037  002342                    CLR       DATBUF+2            ;32 BITS WORTH
5015 031322  012737  000001  002350  2$:       MOV       #1,SBEMSK           ;SINGLE ERROR MASK
5016 031330  005037  002352                    CLR       SBEMSK+2            ;
5017 031334  012737  000001  002354  3$:       MOV       #1,DBEMSK           ;DOUBLE ERROR MASK
5018 031342  005037  002356                    CLR       DBEMSK+2            ;
5019 031346  013737  002340  002344  4$:       MOV       DATBUF,TSTDAT       ;PRESERVE ORIG DATA
5020 031354  013737  002342  002346            MOV       DATBUF+2,TSTDAT+2
5021 031362  105737  002362                    TSTB      PASFLG  ;WHICH PASS ?
5022 031366  001404                            BEQ       5$                  ;FIRST PASS, NO COMPLEMENTING
5023 031370  005137  002344                    COM       TSTDAT
5024 031374  005137  002346                    COM       TSTDAT+2            ;SECOND PASS, COMPLEMENT TSTDAT
5025 031400  104503                    5$:     CLR1CSR                       ;CLEAR 1 SELECTED MK11 CSR
5026 031402  023737  002350  002354            CMP       SBEMSK,DBEMSK       ;CHECK FOR SAME MASKS
5027 031410  001004                            BNE       6$                  ;BR IF NOT EQUAL
5028 031412  023737  002352  002356            CMP       SBEMSK+2,DBEMSK+2         ;SECOND WORD ALSO
5029 031420  001463                            BEQ       11$                 ;BR TO MAKE THEM NOT EQUAL
5030 031422  012737  002344  002402  6$:       MOV       #TSTDAT,SOURCE      ;ADDRESS FOR CHKGEN
5031 031430  004737  040540                    CALL      CHKGEN              ;GO GENERATE CHECK BITS
5032 031434  013701  002350                    MOV       SBEMSK,R1
5033 031440  074137  002344                    XOR       R1,TSTDAT
5034 031444  013701  002352                    MOV       SBEMSK+2,R1
5035 031450  074137  002346                    XOR       R1,TSTDAT+2
5036 031454  013701  002354                    MOV       DBEMSK,R1
5037 031460  074137  002344                    XOR       R1,TSTDAT
5038 031464  013701  002356                    MOV       DBEMSK+2,R1
5039 031470  074137  002346                    XOR       R1,TSTDAT+2
5040 031474  013701  002506            7$:     MOV       TESTADD,R1          ;TEST LOCATION
5041 031500  104471                            ECC1DIS                       ;DISABLE ECC ON 1 SELECTED CSR
5042 031502  013721  002344                    MOV       TSTDAT,(R1)+        ;WRITE FIRST 16 BITS
5043                                                       ;LOAD CSR WITH IMAGE FROM R2
5044 031506  104475                            CB1CSR                        ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
5045 031510  013711  002346                    MOV       TSTDAT+2,(R1)       ;WRITE SECOND 16 BITS + CHECKBITS
5046 031514  104503                            CLR1CSR                       ;CLEAR 1 SELECTED MK11 CSR
5047 031516  013702  002506                    MOV       TESTADD,R2          ;GET ADDRESS OF TEST LOC
5048 031522  010203                            MOV       R2,R3               ;R2 DESIGNATES FIRST BYTE
5049 031524  062703  000003                    ADD       #3,R3               ;R3 DESIGNATES LAST BYTE
5050 031530  112722  000360            8$:     MOVB      #360,(R2)+          ;TRY WRITING A BYTE
5051 031534  013701  002506                    MOV       TESTADD,R1
5052 031540  012100                            MOV       (R1)+,R0
5053 031542  023700  002344                    CMP       TSTDAT,R0           ;CHECK FOR UNCHANGED DATA
5054 031546  001401                            BEQ       9$                  ;BR IF OK
5055 031550  104455                            PERR31
5056
5057 031552  011100                    9$:     MOV       (R1),R0
5058 031554  023700  002346                    CMP       TSTDAT+2,R0         ;READ SECOND WORD
5059 031560  001401                            BEQ       10$                 ;BR IF UNCHANGED
5060 031562  104455                            PERR31
5061
5062 031564  020203                    10$:    CMP       R2,R3               ;TESTED LAST BYTE ?
5063 031566  001360                            BNE       8$                  ;BR IF NO
```

```
5064 031570 005737 002356          11$:  TST     DBEMSK+2        ;CHECKING FOR LAST ERROR BIT
5065 031574 100405                       BMI     12$             ;BR IF DONE HERE
5066 031576                              DLEFT   DBEMSK
     031576 006137 002354                ROL     DBEMSK
     031602 006137 002356                ROL     DBEMSK+2
                                         .DSABL  CRF
5067 031606 000657                       BR      4$
5068 031610                        12$:  IF #SW11 SET.IN @SWR THEN GOTO 13$
     031610 032777 004000 151150                                                BIT #SW11,@SWR
     031616 001013                                                              BNE 13$
5069 031620                              IF QVFLAG IS TRUE THEN GOTO 13$
     031620 005737 002440                                                       TST QVFLAG
     031624 001010                                                              BNE 13$
5070 031626 005737 002352                TST     SBEMSK+2        ;LAST SBE MASK
5071 031632 100405                       BMI     13$             ;BR IF DONE WITH THIS PASS
5072 031634                              DLEFT   SBEMSK
     031634 006137 002350                ROL     SBEMSK
     031640 006137 002352                ROL     SBEMSK+2
                                         .DSABL  CRF
5073 031644 000633                       BR      3$
5074 031646 105737 002362          13$:  TSTB    PASFLG  ;TEST PASS FLAG
5075 031652 001003                       BNE     14$             ;NON ZERO MEANS WE'RE DONE
5076 031654 105237 002362                INCB    PASFLG  ;NOT DONE
5077 031660 000614                       BR      1$
5078 031662 104471                 14$:  ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
5079 031664 013701 002506                MOV     TESTADD,R1      ;TEST LOCATION
5080 031670                              CLEAR   (R1)+,(R1)      ;TO ERASE ANY DBE'S FROM TESTING
     031670 005021                                                              CLR   (R1)+
     031672 005011                                                              CLR   (R1)
5081                                     ;RESTORE CSR
5082 031674 104503                       CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
5083 031676 000207                       RETURN
```

```
 5087 031700                            MTP016: SUBTST  <<MTP016        WRITE INHIBIT OF WORD WITH DBE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MTP016  WRITE INHIBIT OF WORD WITH DBE
                                        ;*****************************************************************************
 5088                                           ;DOUBLE BIT ERROR WRITE CANCEL WITH
 5089                                           ;WORD WRITE.
 5090                                           ;CHECKS WRITE INHIBIT WITH WORD WRITES TO
 5091                                           ;WORD WITH DOUBLE ERROR.
 5092 031700  005037  002340          T12A:    CLR     DATBUF          ;BACKGROUND FOR DOUBLE ERRORS
 5093 031704  005037  002342                   CLR     DATBUF+2        ;2 WORDS WORTH
 5094 031710  012737  000001  002350           MOV     #1,SBEMSK       ;SINGLE ERROR MASK
 5095 031716  005037  002352                   CLR     SBEMSK+2        ;
 5096 031722  012737  000001  002354  T12B.    MOV     #1,DBEMSK       ;DOUBLE ERROR MASK
 5097 031730  005037  002356                   CLR     DBEMSK+2
 5098 031734  013737  002340  002344  1$:      MOV     DATBUF,TSTDAT   ;DATA FOR TEST
 5099 031742  013737  002342  002346           MOV     DATBUF+2,TSTDAT+2;BOTH WORDS
 5100 031750  105737  002362                   TSTB    PASFLG  ;COMP DATA ON SECOND PASS ONLY
 5101 031754  001404                           BEQ     2$              ;BR IF FIRST PASS
 5102 031756  005137  002344                   COM     TSTDAT          ;COMP FIRST WORD
 5103 031762  005137  002346                   COM     TSTDAT+2        ;NOW SECOND WORD
 5104 031766  023737  002350  002354  2$:      CMP     SBEMSK,DBEMSK   ;CHECK FOR IDENTICAL MASKS
 5105 031774  001004                           BNE     3$              ;BR IF DIFFERENT
 5106 031776  023737  002352  002356           CMP     SBEMSK+2,DBEMSK+2;UPPER WORD TOO
 5107 032004  001470                           BEQ     8$              ;BR TO MAKE THEM NOT EQUAL
 5108 032006  012737  002344  002402  3$:      MOV     #TSTDAT,SOURCE  ;NEED ADDR OF DATA FOR CHKGEN
 5109 032014  004737  040540                   CALL    CHKGEN          ;GO GENERATE CHECK BITS
 5110 032020  013701  002350                   MOV     SBEMSK,R1
 5111 032024  074137  002344                   XOR     R1,TSTDAT
 5112 032030  013701  002352                   MOV     SBEMSK+2,R1
 5113 032034  074137  002346                   XOR     R1,TSTDAT+2
 5114 032040  013701  002354                   MOV     DBEMSK,R1
 5115 032044  074137  002344                   XOR     R1,TSTDAT
 5116 032050  013701  002356                   MOV     DBEMSK+2,R1
 5117 032054  074137  002346                   XOR     R1,TSTDAT+2
 5118 032060  013701  002506          4$:      MOV     TESTADD,R1      ;FIRST TEST ADRRESS
 5119 032064  104471                           ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5120 032066  013721  002344                   MOV     TSTDAT,(R1)+    ;WRITE FIRST 16 BITS
 5121 032072  104475                           CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 5122 032074  013711  002346                   MOV     TSTDAT+2,(R1)   ;WRITE SECOND 16 BITS + CHECKBITS
 5123 032100  105037  002363                   CLRB    UPPFLG          ;SET FOR 2 LOOPS
 5124 032104  162701  000002                   SUB     #2,R1           ;POINT TO LOW WORD
 5125 032110  104503          5$:      CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
 5126 032112  012711  177400                   MOV     #177400,(R1)    ;TRY WRITING LOCATION
 5127 032116  013701  002506                   MOV     TESTADD,R1
 5128 032122  011100                           MOV     (R1),R0
 5129 032124  023700  002344                   CMP     TSTDAT,R0       ;CHECK FOR ORIGINAL DATA
 5130 032130  001401                           BEQ     6$              ;SHOULD BE UNCHANGED
 5131 032132  104455                           PERR31
 5132
 5133 032134  062701  000002          6$:      ADD     #2,R1
 5134 032140  011100                           MOV     (R1),R0
 5135 032142  023700  002346                   CMP     TSTDAT+2,R0     ;THIS SHOULD BE UNCHANGED ALSO
 5136 032146  001401                           BEQ     7$
 5137 032150  104455                           PERR31
```

```
5140 032152  105737  002363          7$:     TSTB    UPPFLG          ;WHICH LOOP ?
5141 032156  001003                          BNE     8$              ;SECOND, BR OUT
5142 032160  105237  002363                  INCB    UPPFLG          ;FIRST, KEEP GOING
5143 032164  000751                          BR      5$
5144 032166  005737  002356          8$:     TST     DBEMSK+2        ;LAST BIT ?
5145 032172  100405                          BMI     9$              ;MINUS = BIT 31
5146 032174                                   DLEFT   DBEMSK
     032174  006137  002354                  ROL     DBEMSK
     032200  006137  002356                  ROL     DBEMSK+2
                                              .DSABL  CRF
5147 032204  000653                          BR      1$
5148 032206                          9$:     IF #SW11 SET.IN @SWR THEN GOTO 10$
     032206  032777  004000  150552                                                  BIT #SW11,@SWR
     032214  001014                                                                  BNE 10$
5149 032216                                   IF QVFLAG IS TRUE THEN GOTO 10$
     032216  005737  002440                                                          TST QVFLAG
     032222  001011                                                                  BNE 10$
5150 032224  005737  002352                  TST     SBEMSK+2        ;LAST BIT IN THIS MASK ?
5151 032230  100406                          BMI     10$             ;BR IF LAST BIT
5152 032232                                   DLEFT   SBEMSK
     032232  006137  002350                  ROL     SBEMSK
     032236  006137  002352                  ROL     SBEMSK+2
                                              .DSABL  CRF
5153 032242  000137  031722                  JMP     T12B
5154 032246  105737  002362          10$:    TSTB    PASFLG  ;FIRST PASS ?
5155 032252  001004                          BNE     11$             ;BR IF SECOND
5156 032254  105237  002362                  INCB    PASFLG  ;INDICATE SECOND PASS COMING
5157 032260  000137  031700                  JMP     T12A
5158 032264  104471                  11$:    ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
5159 032266  013701  002506                  MOV     TESTADD,R1      ;RESTORE TEST ADDRESS
5160 032272  005021                          CLR     (R1)+           ;CLEAR ANY DBE'S FROM TEST
5161 032274  005011                          CLR     (R1)
5162 032276  104503                          CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
5163 032300  000207                          RETURN
```

```
 5167 032302                            MTP017: SUBTST  <<MTP017        HOLDING 1'S & 0'S TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTP017  HOLDING 1'S & 0'S TEST
                                        ;*********************************************************************
 5168                                           ;*(1)    THIS TEST CHECKS THE MEMORY FOR THE CAPABILITY
 5169                                           ;*       OF HOLDING 1'S AND 0'S BY WRITING A BACKGROUND
 5170                                           ;*       OF 000377 AND READING IT
 5171                                           ;*(2)    MEMORY IS WRITTEN USING A BYTE AT A TIME
 5172                                           ;*(3)    STEPS 1 & 2 ARE REPEATED WITH A SWAPPED BACKGROUND PATTERN
 5173                                           ;NOTE:   THIS TEST WRITES BYTES & READS WORDS
 5174 032302  012701  060000                   MOV     #FIRST,R1
 5175 032306  010104                           MOV     R1,R4
 5176 032310  012705  160000                   MOV     #LAST+2,R5
 5177 032314  012700  000377                   MOV     #377,R0         ;GET THE PATTERN INTO R0
 5178 032320  010003                           MOV     R0,R3
 5179 032322  000303                           SWAB    R3
 5180 032324  110021                  1$:      MOVB    R0,(R1)+        ;WRITE A BYTE
 5181 032326  110321                           MOVB    R3,(R1)+        ;WRITE THE MEMORY WITH THE BYTE STORED IN BAKPAT
 5182 032330  020105                           CMP     R1,R5           ;COMPARE TEST LOC TO TOP + 2
 5183 032332  103774                           BLO     1$              ;BRANCH IF LOWER
 5184
 5185 032334  014102                  2$:      MOV     -(R1),R2
 5186 032336  020002                           CMP     R0,R2           ;TEST THE MEMORY TO SEE IF IT CONTAINS
 5187                                                                  ;THE WORD STORED IN BAKPAT
 5188 032340  001401                           BEQ     3$
 5189 032342  104446                           PERR22
 5190
 5191 032344  020104                  3$:      CMP     R1,R4           ;KEEP ON TESTING THE MEMORY UNTIL
 5192 032346  101372                           BHI     2$              ;R1 EQUALS THE LOWEST ADDRESS
 5193 032350  000303                           SWAB    R3              ;CHANGE THE DATA PATTERN
 5194 032352  000300                           SWAB    R0
 5195 032354  001763                           BEQ     1$              ;IF THE DATA PATTERN DOES NOT HAVE BOTH
 5196                                                                  ; BYTE -0 THEN FALL THRU
 5197 032356  000207                           RETURN
```

```
 5201 032360                            MTP020: SUBTST  <<MTP020        MARCHING 1'S & 0'S IN CHECK BITS TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTP020  MARCHING 1'S & 0'S IN CHECK BITS TEST
                                        ;*********************************************************************
 5202                                           ;*THIS TEST IS CONCERNED ONLY WITH THE INTEGRITY
 5203                                           ;*OF THE MOS RAMS THAT STORE THE CHECKBITS.
 5204
 5205                                           ;WRITE UP        ;100 --> CHECKBITS
 5206 032360  010311                    MTP20A: MOV     R3,(R1)          ;V177640
 5207 032362  010461  000002                    MOV     R4,2(R1)         ;V177642
 5208 032366  060201                            ADD     R2,R1            ;V177646
 5209 032370  020105                            CMP     R1,R5            ;V177650        ;TOP + 2 ?
 5210 032372  103772                            BLO     MTP20A           ;V177652        ;BR IF NOT
 5211 032374  000207                            RETURN                   ;V177654
 5212
 5213                                           ;100 --> 077 DOWN
 5214 032376  160201                    MTP20B: SUB     R2,R1            ;V177640
 5215 032400  020461  000002                    CMP     R4,2(R1)         ;V177642        ;2ND WORD OK?
 5216 032404  001002                            BNE     21$              ;V177646        ;NO - SKIP
 5217 032406  005711                            TST     (R1)             ;V177650        ;1ST WORD OK?
 5218 032410  001401                            BEQ     3$               ;V177652        ;YES - SKIP
 5219 032412  104452                    21$:    PERR26                   ;V177654        ;GOOD=000000,,100000,,100
 5220 032414  010361  000002            3$:     MOV     R3,2(R1)         ;V177656
 5221 032420  010311                            MOV     R3,(R1)          ;V177662
 5222 032422  020100                            CMP     R1,R0            ;V177664
 5223 032424  001364                            BNE     MTP20B           ;V177666
 5224 032426  000207                            RETURN                   ;V177670
 5225
 5226                                           ;077 --> 100 UP
 5227 032430  005711                    MTP20C: TST     (R1)             ;V177640        ;1ST WORD OK?
 5228 032432  001003                            BNE     41$              ;V177642        ;NO - SKIP
 5229 032434  005761  000002                    TST     2(R1)            ;V177644        ;2ND WORD OK?
 5230 032440  001401                            BEQ     5$               ;V177650        ;YES - SKIP
 5231 032442  104453                    41$:    PERR27                   ;V177652        ;GOOD=000000,,000000,,077
 5232 032444  010311                    5$:     MOV     R3,(R1)          ;V177654        ;WRITE 1ST WORD
 5233 032446  010461  000002                    MOV     R4,2(R1)         ;V177656        ;WRITE 2ND WORD
 5234 032452  060201                            ADD     R2,R1            ;V177662
 5235 032454  020105                            CMP     R1,R5            ;V177664        ;TOP + 2 YET?
 5236 032456  103764                            BLO     MTP20C           ;V177666        ;NO - LOOP
 5237 032460  000207                            RETURN                   ;V177670
 5238
 5239                                           ;100 --> 077 UP
 5240 032462  005711                    MTP20D: TST     (R1)             ;V177640        ;1ST WORD OK?
 5241 032464  001003                            BNE     61$              ;V177642        ;NO - SKIP
 5242 032466  020461  000002                    CMP     R4,2(R1)         ;V177644        ;2ND WORD OK?
 5243 032472  001401                            BEQ     7$               ;V177650        ;YES - SKIP
 5244 032474  104452                    61$:    PERR26                   ;V177652
 5245 032476  010311                    7$:     MOV     R3,(R1)          ;V177654
 5246 032500  010361  000002                    MOV     R3,2(R1)         ;V177656
 5247 032504  060201                            ADD     R2,R1            ;V177662
 5248 032506  020105                            CMP     R1,R5            ;V177664        ;TOP + 2 YET?
 5249 032510  103764                            BLO     MTP20D           ;V177666        ;NO - LOOP
 5250 032512  000207                            RETURN                   ;V177670
```

```
                                        ;077 --> 100 DOWN
032514  160201          MTP20E: SUB     R2,R1           ;V177640
032516  005761  000002          TST     2(R1)           ;V177642    ;2ND WORD OK?
032522  001002                  BNE     81$             ;V177646    ;NO - SKIP
032524  005711                  TST     (R1)            ;V177650    ;1ST WORD OK?
032526  001401                  BEQ     9$              ;V177652    ;YES - SKIP
032530  104453          81$:    PERR27                  ;V177654
032532  010461  000002  9$:     MOV     R4,2(R1)        ;V177656    ;WRITE 2ND WORD
032536  010311                  MOV     R3,(R1)         ;V177662    ;WRITE 1ST WORD
032540  020100                  CMP     R1,R0           ;V177664    ;BOTTOM YET?
032542  001364                  BNE     MTP20E          ;V177666    ;NO - LOOP
032544  000207                  RETURN                  ;V177670
                                        ;100 UP
032546  005711          MTP20F: TST     (R1)            ;V177640    ;1ST WORD OK?
032550  001003                  BNE     101$            ;V177642    ;NO - SKIP
032552  020461  000002          CMP     R4,2(R1)        ;V177642    ;2ND WORD OK?
032556  001401                  BEQ     11$             ;V177646    ;YES - SKIP
032560  104452          101$:   PERR26                  ;V177650
032562  060201          11$:    ADD     R2,R1           ;V177652
032564  020105                  CMP     R1,R5           ;V177654    ;TOP + 2 YET?
032566  103767                  BLO     MTP20F          ;V177656    ;NO - LOOP
032570  000207                  RETURN                  ;V177660
```

```
5279 032572                            MTPA20: SUBTST  <<MTPA20        SLOW MARCHING 1'S & 0'S IN CHECK BITS TEST>>
                                       ;*********************************************************************
                                       ;*SUBTEST       MTPA20  SLOW MARCHING 1'S & 0'S IN CHECK BITS TEST
                                       ;*********************************************************************
5280                                           ;*THIS TEST IS CONCERNED ONLY WITH THE INTEGRITY
5281                                           ;*OF THE MOS RAMS THAT STORE THE CHECKBITS.
5282 032572                                    SET     SBEFLAG
     032572  012737  177777  002022                                                    MOV  #-1,SBEFLA
5283 032600  013737  002144  002150            MOV     CSR,SBECSR
5284 032606  013737  002146  002152            MOV     CSR+2,SBECSR+2
5285 032614  013701  002336                    MOV     CSRFIRST,R1     ;FIRST TEST LOC
5286 032620  013702  002414                    MOV     CSRINC,R2
5287 032624  010103                           MOV     R1,R3
5288 032626  005004                           CLR     R4
5289 032630  012705  160000                    MOV     #LAST+2,R5
5290 032634  005037  002144                    CLR     CSR
5291 032640  104505                           CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
5292                                           ;*************************************************************
5293                                           ;
5294 032642  010411                    2$:     MOV     R4,(R1)         ;WRITE CHECKBITS BY WRITING LOC     * WRITE UP
5295 032644  060201                           ADD     R2,R1           ;POINT TO NEXT WORD                 * 0'S --> CHK BITS
5296 032646  020105                           CMP     R1,R5           ;TOP + 2                            *
5297 032650  103774                           BLO     2$              ;BR IF NOT                          *
5298                                           ;*************************************************************
5299
5300                                           ;*************************************************************
5301 032652  160201                    3$:     SUB     R2,R1           ;ADJUST R1                          *
5302 032654  005711                           TST     (R1)            ;READ                               *
5303 032656  104426                           READCSR                 ;                                   *
5304 032660  032737  077400  002144            BIT     #77400,@#CSR    ;SHOULD BE ALL ZEROS                *
5305 032666  001406                           BEQ     4$              ;BR IF OK                           *
5306 032670  013700  002144                    MOV     CSR,R0          ;                                   *
5307 032674  000300                           SWAB    R0              ;                                   *
5308 032676  042700  000200                    BIC     #200,R0         ;                                   *
5309 032702  104435                           PERR11                  ;                                   *
5310                                                                   ;                                   *
5311 032704  012737  077400  002144    4$:     MOV     #77400,@#CSR    ;MAKE CHECKBITS ALL 1'S             *0'S --> 1'S
5312 032712  104505                           CHK1DIS                 ;DSABL ECC & WRITE CHKBTS FROM 1 CSR  * DOWN
5313 032714  005104                           COM     R4              ;COMP THE DATA                      *
5314 032716  010411                           MOV     R4,(R1)         ;WRITE THE CHECKBITS                *
5315 032720  020103                           CMP     R1,R3           ;BOTTOM YET?                        *
5316 032722  001353                           BNE     3$              ;BR IF NO                           *
5317                                           ;*************************************************************
5318
5319 032724  005037  002144                    CLR     CSR
5320 032730  104505                           CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
```

```
5323
5324 032732  005711                  5$:   TST     (R1)            ;READ THE LOC AGAIN                    *
5325 032734  104426                        READCSR                 ;                                      *
5326 032736  013700  002144                MOV     @#CSR,R0        ;GET CSR CONTENTS INTO R0              *
5327 032742  042700  100377                BIC     #100377,R0      ;ONLY WANT BITS 11-5                   *
5328 032746  022700  077400                CMP     #77400,R0       ;READ FOR ALL 1'S                      *
5329 032752  001404                        BEQ     6$              ;BR IF OK                              *
5330 032754  000300                        SWAB    R0              ;                                      *
5331 032756  042700  000200                BIC     #200,R0         ;                                      *
5332 032762  104445                        PERR21                  ;                                      *  1'S --> 0
5333                                                               ;                                      *  UP
5334 032764  005037  002144          6$:   CLR     CSR             ;                                      *
5335 032770  104505                        CHK1DIS                 ;DSABL ECC & WRITE CHKBTS FROM 1 CSR   *
5336 032772  005104                        COM     R4              ;                                      *
5337 032774  010411                        MOV     R4,(R1)         ;ACCESS THE LOC                        *
5338 032776  060201                        ADD     R2,R1           ;POINT TO NEXT ADDRESS                 *
5339 033000  020105                        CMP     R1,R5           ;TOP+2 YET?                            *
5340 033002  103753                        BLO     5$              ;BR IF NOT                             *
5341                                                               ;*****************************************
5342
5343 033004  010301                        MOV     R3,R1
5344
5345                                                               ;*****************************************
5346 033006  005711                  7$:   TST     (R1)            ;READ                                  *
5347 033010  104426                        READCSR                 ;                                      *
5348 033012  032737  077400  002144        BIT     #77400,@#CSR    ;CHECKBITS SHOULD BE ZERO              *
5349 033020  001406                        BEQ     8$              ;BR IF OK                              *
5350 033022  013700  002144                MOV     CSR,R0          ;                                      *
5351 033026  000300                        SWAB    R0              ;                                      *
5352 033030  042700  000200                BIC     #200,R0         ;                                      *
5353 033034  104435                        PERR11                  ;                                      *  0'S --> 1'S
5354                                                               ;                                      *  UP
5355 033036  012737  077400  002144  8$:   MOV     #77400,@#CSR    ;COMP CHECKBITS                        *
5356 033044  104505                        CHK1DIS                 ;DSABL ECC & WRITE CHKBTS FROM 1 CSR   *
5357 033046  005104                        COM     R4              ;                                      *
5358 033050  010411                        MOV     R4,(R1)         ;WRITE THE LOC                         *
5359 033052  060201                        ADD     R2,R1           ;POINT TO NEXT ADDRESS                 *
5360 033054  020105                        CMP     R1,R5           ;TOP+2 YET?                            *
5361 033056  103753                        BLO     7$              ;BR IF NOT                             *
5362                                                               ;*****************************************
5363
5364 033060  005037  002144                CLR     CSR
5365 033064  104505                        CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
```

```
5368
5369 033066  160201                    9$:   SUB     R2,R1             ;ADJUST R1                                    *
5370 033070  005711                          TST     (R1)              ;READ                                         *
5371 033072  104426                          READCSR                   ;                                             *
5372 033074  013700  002144                  MOV     @#CSR,R0          ;GET CSR CONTENTS                             *
5373 033100  042700  100377                  BIC     #100377,R0        ;ONLY WANT CHECKBITS                          *
5374 033104  022700  077400                  CMP     #77400,R0         ;ALL 1'S?                                     *
5375 033110  001404                          BEQ     10$               ;BR IF OK                                     *
5376 033112  000300                          SWAB    R0                ;                                             *
5377 033114  042700  000200                  BIC     #200,R0           ;                                             *
5378 033120  104445                          PERR21                    ;                                             *1'S --> 0'S
5379                                                                   ;                                             * DOWN
5380 033122  005037  002144          10$:    CLR     CSR               ;                                             *
5381 033126  104505                          CHK1DIS                   ;DSABL ECC & WRITE CHKBTS FROM 1 CSR          *
5382 033130  005104                          COM     R4                ;COMP THE DATA                                *
5383 033132  010411                          MOV     R4,(R1)           ;WRITE THE CHECKBITS                          *
5384 033134  020103                          CMP     R1,R3             ;BOTTOM YET?                                  *
5385 033136  001353                          BNE     9$                ;BR IF NO                                     *
5386                                         ;*************************************************************************
5387
5388                                         ;*************************************************************************
5389 033140  005711                  11$:    TST     (R1)              ;READ                                         *
5390 033142  104426                          READCSR                   ;                                             *
5391 033144  032737  077400  002144          BIT     #77400,@#CSR      ;SHOULD BE ALL 0'S                            *
5392 033152  001406                          BEQ     12$               ;BR IF OK                                     *
5393 033154  013700  002144                  MOV     CSR,R0            ;                                             *
5394 033160  000300                          SWAB    R0                ;                                             *
5395 033162  042700  000200                  BIC     #200,R0           ;                                             *
5396 033166  104435                          PERR11                    ;                                             *0'S
5397                                                                   ;                                             * UP
5398 033170  060201                  12$:    ADD     R2,R1             ;POINT TO NEXT WORD                           *
5399 033172  005037  002144                  CLR     CSR               ;                                             *
5400 033176  104505                          CHK1DIS                   ;DSABL ECC & WRITE CHKBTS FROM 1 CSR          *
5401 033200  020105                          CMP     R1,R5             ;TOP + 2 YET?                                 *
5402 033202  103756                          BLO     11$               ;BR IF NOT                                    *
5403                                         ;*************************************************************************
5404
5405                                         ;FLUSH OUT ALL THESE DBE'S
5406 033204                                  BMOV    MTP030
     033204  004537  043710                      JSR R5,BLOCK1
     033210  034704                          MTP030
                                              .DSABL      CRF
5407 033212  012700  060000                  MOV     #FIRST,R0
5408 033216  012701  040000                  MOV     #SIZE,R1
5409 033222  104471                          ECC1DIS                   ;DISABLE ECC ON 1 SELECTED CSR
5410 033224  004737  177640                  CALL    FASTCITY                  ;CALL TO THE USER INSTRUCTION PAR'S
5411 033230  104503                          CLR1CSR                   ;CLEAR 1 SELECTED MK11 CSR
5412 033232  000207                          RETURN
```

```
5416 033234                    MTPA21: SUBTST  <<MTPA21        MARCHING 1'S & 0'S PATTERN TEST>>
                               ;*********************************************************************
                               ;*SUBTEST       MTPA21  MARCHING 1'S & 0'S PATTERN TEST
                               ;*********************************************************************
5417                                   ;READ,BYTESWAP-MODIFY,READ,DOWN
5418 033234  014100            1$:     MOV     -(R1),R0;V177640
5419 033236  020200                    CMP     R2,R0   ;V177642
5420 033240  001401                    BEQ     2$      ;V177644
5421 033242  104443                    PERR17          ;V177646
5422
5423 033244  000311            2$:     SWAB    (R1)    ;V177650
5424 033246  011100                    MOV     (R1),R0 ;V177652
5425 033250  020300                    CMP     R3,R0   ;V177654
5426 033252  001401                    BEQ     3$      ;V177656
5427 033254  104444                    PERR20          ;V177660
5428
5429 033256  020401            3$:     CMP     R4,R1   ;V177662        ;DONE?
5430 033260  001365                    BNE     1$      ;V177664        ;NO - LOOP
5431 033262  000207                    RETURN          ;V177666        ;YES - RETURN
5432
5433 033264                    MTPB21: ;READ,BYTESWAP-MODIFY,READ,UP
5434 033264  011100            1$:     MOV     (R1),R0 ;V177640
5435 033266  020300                    CMP     R3,R0   ;V177642
5436 033270  001401                    BEQ     2$      ;V177644
5437 033272  104444                    PERR20          ;V177646
5438
5439 033274  000311            2$:     SWAB    (R1)    ;V177650
5440 033276  011100                    MOV     (R1),R0 ;V177652
5441 033300  020200                    CMP     R2,R0   ;V177654
5442 033302  001401                    BEQ     3$      ;V177656
5443 033304  104443                    PERR17          ;V177660
5444
5445 033306  062701  000002    3$:     ADD     #2,R1   ;V177662
5446 033312  020501                    CMP     R5,R1   ;V177666        ;DONE?
5447 033314  001363                    BNE     1$      ;V177670        ;NO - LOOP
5448 033316  000207                    RETURN          ;V177672        ;YES - RETURN
5449
5450 033320                    MTPC21: ;READ,BYTESWAP-MODIFY,READ,UP
5451 033320  011100            1$:     MOV     (R1),R0 ;V177640
5452 033322  020200                    CMP     R2,R0   ;V177642
5453 033324  001401                    BEQ     2$      ;V177644
5454 033326  104443                    PERR17          ;V177646
5455
5456 033330  000311            2$:     SWAB    (R1)    ;V177650
5457 033332  011100                    MOV     (R1),R0 ;V177652
5458 033334  020300                    CMP     R3,R0   ;V177654
5459 033336  001401                    BEQ     3$      ;V177656
5460 033340  104444                    PERR20          ;V177660
5461
5462 033342  062701  000002    3$:     ADD     #2,R1   ;V177662
5463 033346  020501                    CMP     R5,R1   ;V177666        ;DONE?
5464 033350  001363                    BNE     1$      ;V177670        ;NO - LOOP
5465 033352  000207                    RETURN          ;V177672        ;YES - RETURN
```

```
 5468 033354                        MTPD21: ;READ,BYTESWAP-MODIFY,READ,DOWN
 5469 033354  014100                1$:     MOV     -(R1),R0;V177640
 5470 033356  020300                        CMP     R3,R0   ;V177642
 5471 033360  001401                        BEQ     2$      ;V177644
 5472 033362  104444                        PERR20          ;V177646
 5473
 5474 033364  000311                2$:     SWAB    (R1)    ;V177650
 5475 033366  011100                        MOV     (R1),R0 ;V177652
 5476 033370  020200                        CMP     R2,R0   ;V177654
 5477 033372  001401                        BEQ     3$      ;V177656
 5478 033374  104443                        PERR17          ;V177660
 5479
 5480 033376  020401                3$:     CMP     R4,R1   ;V177662        ;DONE?
 5481 033400  001365                        BNE     1$      ;V177664        ;NO - LOOP
 5482 033402  000207                        RETURN          ;V177666        ;YES - RETURN
 5483
```

```
5487 033404                          MTP022: SUBTST  <<MTP022        REFRESH & SHIFTING DIAGONAL TEST>>
                                     ;*********************************************************************
                                     ;*SUBTEST       MTP022  REFRESH & SHIFTING DIAGONAL TEST
                                     ;*********************************************************************
5488                                         ;(1)    WE WRITE A DIAGONAL PATTERN IN MEMORY (WITH CACHE ON).
5489                                         ;(2)    IF A REFRESH TEST WE DISTURB ALL ROWS FOR > 2 MS (WITH CACHE ON).
5490                                         ;(3)    WE READ & CHECK FOR CORRECTNESS THE DIAGONAL PATTERN
5491                                         ;       (WITH CACHE OFF).
5492         000010                      KDIAG=8.                ;HOW OFTEN A DIAGONAL STRIPE OCCURS (MUST BE A POWER OF 2)
5493 033404                                  FOR EVEN := #1 TO #2                        ;FOR DATA & COMPLEMENT DATA
     033404  012737  000001  002456                                                          MOV #1,EVEN
     033412                                                                          B43:::::::
5494 033412                                    IF EVEN EQ #1
     033412  023727  002456  000001                                                          CMP EVEN,#1
     033420  001005                                                                         BNE L367
5495 033422                                      LET R2 := ZEROS
     033422  013702  002430                                                                 MOV ZEROS,R2
5496 033426                                      LET R3 := ONES
     033426  013703  002726                                                                 MOV ONES,R3
5497 033432                                    ELSE
     033432  000404                                                                         BR L370
     033434                                                                          L367:::::::
5498 033434                                      LET R2 := ONES
     033434  013702  002726                                                                 MOV ONES,R2
5499 033440                                      LET R3 := ZEROS
     033440  013703  002430                                                                 MOV ZEROS,R3
5500 033444                                    END ;OF IF EVEN
     033444                                                                          L370:::::::
5501 033444                                    FOR STRIPES := #0 TO #KDIAG-1         ;FOR THE NUMBER OF STRIPES
     033444  005037  002460                                                                 CLR STRIPES
     033450                                                                          B44:::::::
5502
5503
5504 033450  104423                              ;WRITE LOOP
                                                 CACHON                        ;TURN CACHE ON
5505 033452                                      LET COUNT := STRIPES
     033452  013737  002460  002462                                                         MOV STRIPES,COUNT
5506 033460                                      LET R1 := #FIRST
     033460  012701  060000                                                                 MOV #FIRST,R1
5507 033464                                      WHILE R1 LOS #LAST
     033464                                                                          B45:::::::
     033464  020127  157776                                                                 CMP R1,#LAST
     033470  101032                                                                         BHI L371
5508 033472                                        IF COUNT LT #0 THEN LET COUNT := #KDIAG-1
     033472  005737  002462                                                                 TST COUNT
     033476  002003                                                                         BGE L372
     033500  012737  000007  002462                                                         MOV #KDIAG-1,COUNT
     033506                                                                          L372:::::::
5509 033506                                        IF #374 OFF.IN R1 THEN LET COUNT := COUNT - #1
     033506  032701  000374                                                                 BIT #374,R1
     033512  001002                                                                         BNE L373
     033514  005337  002462                                                                 DEC COUNT
     033520                                                                          L373:::::::
5510 033520                                        IF COUNT NE #0
     033520  005737  002462                                                                 TST COUNT
     033524  001404                                                                         BEQ L374
5511 033526                                          LET (R1) := R2
     033526  010211                                                                         MOV R2,(R1)
```

```
5512 033530                                   LET 2(R1) := R2                    MOV R2,2(R1)
     033530  010261  000002
5513 033534                                   ELSE                               BR L375
     033534  000403                                                          L374:;;;;;;
     033536
5514 033536                                   LET (R1) := R3                     MOV R3,(R1)
     033536  010311
5515 033540                                   LET 2(R1) := R3                    MOV R3,2(R1)
     033540  010361  000002
5516 033544                                   END ;OF IF COUNT                 L375:;;;;;;
     033544
5517 033544                                   LET COUNT := COUNT - #1            DEC COUNT
     033544  005337  002462
5518 033550                                   LET R1 :- R1 + #4                  ADD #4,R1
     033550  062701  000004
5519 033554                                 END ;OF WHILE                        BR B45
     033554  000743                                                          L371:;;;;;;
     033556                                                                  E45:;;;;;;
     033556
5520                                        ;END OF WRITE LOOP
5521
5522 033556                                 IF DIAGFLAG IS FALSE THEN $CALL REFRESH
     033556  005737  002006                                                   TST DIAGFLAG
     033562  001002                                                           BNE L376
     033564  004737  033760                                                   JSR PC,REFRESH
     033570                                                                L376:;;;;;;
```

```
5525                                    ;READ LOOP
5526 033570                             LET COUNT := STRIPES
     033570 013737 002460 002462                                    MOV STRIPES,COUNT
5527 033576                             LET R1 := #FIRST
     033576 012701 060000                                           MOV #FIRST,R1
5528 033602 104424                      CACHOFF                    ;TURN CACHE OFF
5529 033604                             WHILE R1 LOS #LAST
     033604                                                     B46:::::::
     033604 020127 157776                                           CMP R1,#LAST
     033610 101046                                                  BHI L377
5530 033612                               IF COUNT LT #0 THEN LET COUNT := #KDIAG-1
     033612 005737 002462                                           TST COUNT
     033616 002003                                                  BGE L400
     033620 012737 000007 002462                                    MOV #KDIAG-1,COUNT
     033626                                                     L400:::::::
5531 033626                               IF #374 OFF.IN R1 THEN LET COUNT :- COUNT - #1
     033626 032701 000374                                           BIT #374,R1
     033632 001002                                                  BNE L401
     033634 005337 002462                                           DEC COUNT
     033640                                                     L401:::::::
5532 033640                               IF COUNT NE #0
     033640 005737 002462                                           TST COUNT
     033644 001412                                                  BEQ L402
5533 033646                                 LET R0 := (R1)
     033646 011100                                                  MOV (R1),R0
5534 033650                                 IF R2 NE R0
     033650 020200                                                  CMP R2,R0
     033652 001401                                                  BEQ L403
5535 033654 104443                            PERR17
5536 033656                                 END ;OF IF R2
     033656                                                     L403:::::::
5537 033656                                 LET R0 := 2(R1)
     033656 016100 000002                                           MOV 2(R1),R0
5538 033662                                 IF R2 NE R0
     033662 020200                                                  CMP R2,R0
     033664 001401                                                  BEQ L404
5539 033666 104443                            PERR17
5540 033670                                 END ;OF IF R2
     033670                                                     L404:::::::
5541 033670                               ELSE
     033670 000411                                                  BR L405
     033672                                                     L402:::::::
5542 033672                                 LET R0 := (R1)
     033672 011100                                                  MOV (R1),R0
5543 033674                                 IF R3 NE R0
     033674 020300                                                  CMP R3,R0
     033676 001401                                                  BEQ L406
5544 033700 104444                            PERR20
5545 033702                                 END ;OF IF R3
     033702                                                     L406:::::::
5546 033702                                 LET R0 := 2(R1)
     033702 016100 000002                                           MOV 2(R1),R0
5547 033706                                 IF R3 NE R0
     033706 020300                                                  CMP R3,R0
     033710 001401                                                  BEQ L407
5548 033712 104444                            PERR20
5549 033714                                 END ;OF IF R3
```

```
033714                                                              L407:;;;;;;
033714                                    END ;OF IF COUNT
033714                                                              L405:;;;;;;
033714                                    LET COUNT := COUNT - #1
033714  005337  002462                                                      DEC COUNT
033720                                    LET R1 := R1 + #4
033720  062701  000004                                                      ADD #4,R1
033724                                  END ;OF WHILE
033724  000727                                                              BR B46
033726                                                              L377:;;;;;;
033726                                                              E46:;;;;;;
                                        ;END OF READ LOOP

033726                                END ;OF FOR STRIPES
033726  005237  002460                                                      INC STRIPES
033732  023727  002460  000007                                              CMP STRIPES,#KDIAG-1
033740  003643                                                              BLE B44
033742                                                              E44:;;;;;;;
033742                              END ;OF FOR EVEN
033742  005237  002456                                                      INC EVEN
033746  023727  002456  000002                                              CMP EVEN,#2
033754  003616                                                              BLE B43
033756                                                              E43:;;;;;;;
033756  000207                      RETURN
033760                  REFRESH:SUBTST  <<SUBR  REFRESH DELAY>>
                        ;*********************************************************************
                        ;*SUBTEST        SUBR    REFRESH DELAY
                        ;*********************************************************************
                                    ;DISTURB EACH ROW FOR > 3.2 MS
033760                              FOR R0 := #FIRST TO #FIRST+374 BY #4
033760  012700  060000                                                      MOV #FIRST,R0
033764                                                              B47:;;;;;;
033764  004737  034030                CALL REFSUB
033770                              END ;OF FOR R0
033770  062700  000004                                                      ADD #4,R0
033774  020027  060374                                                      CMP R0,#FIRST+374
034000  003771                                                              BLE B47
034002                                                              E47:;;;;;;;
034002                              LET R0 := #FIRST+BIT14
034002  012700  120000                                                      MOV #FIRST+BIT14,R0
034006                              WHILE R0 LOS #LAST+BIT14+374
034006                                                              B50:;;;;;;
034006  020027  020372                                                      CMP R0,#LAST+BIT14+374
034012  101005                                                              BHI L410
034014  004737  034030                CALL REFSUB
034020                                LET R0 := R0 + #4
034020  062700  000004                                                      ADD #4,R0
034024                              END ;OF WHILE
034024  000770                                                              BR B50
034026                                                              L410:;;;;;;
034026                                                              E50:;;;;;;
034026  000207                      RETURN
034030  012704  000640  REFSUB: MOV     #640,R4                 ;TIME FOR A > 3.2 MS LOOP
034034  062700  000002          ADD     #2,R0
034040  005140          1$:     COM     -(R0)
034042  005120                  COM     (R0)+
034044  005110                  COM     (R0)
```

```
5575 034046  005110                          COM     (R0)
5576 034050  077405                          SOB     R4,1$
5577 034052  162700  000002                  SUB     #2,R0
5578 034056  000207                          RETURN
```

```
 5582 034060                            MTPA24: SUBTST  <<MTPA24        FAST GALLOPING PATTERN TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST        MTPA24  FAST GALLOPING PATTERN TEST
                                        ;*********************************************************************
 5583                                           ;THE TOTAL TEST (INCLUDING SETUP) IS AS FOLLOWS
 5584                                           ;*(1)    THIS TEST WRITES THE MEMORY WITH A BACK GROUND PATTERN
 5585                                           ;*       STORED AT LOCATION BAKPAT
 5586                                           ;*(2)    TEST BEGINS AT LOWEST LOCATION BEING TESTED
 5587                                           ;*       (LETS NAME IT 'A')
 5588                                           ;*(3)    LETS NAME THE 1ST LOCATION IN THE ROW/COLUMN UNDER TEST AS 'B'.
 5589                                           ;*(4)    SWAPS BYTES FOR LOCATION 'A'.
 5590                                           ;*(5)    READS 'A', READS 'B'
 5591                                           ;*(6)    'B' = 'B'+400   (ADDS 64 DOUBLE WORDS TO 'B')
 5592                                           ;*(7)    REPEATS STEPS 5 AND 6 UNTIL 'B' IS GREATER THAN THE
 5593                                           ;*(8)    END OF THE BANK  A+2
 5594                                           ;*(9)    REPEATS  STEPS 3-8 UNTILL 'A' REACHES THE END OF THE BANK
 5595                                           ;*(10)   AFTER EXECUTING THE TEST  DATA IS COMPLEMENTED
 5596                                           ;*       AND STEPS 1-9 ARE REPEATED
 5597                                           ;REGISTERS ARE USED AS FOLLOWS
 5598                                           ;R0      TEST DATA
 5599                                           ;R1      'A'
 5600                                           ;R2      'B'
 5601                                           ;R3      BAKPAT
 5602                                           ;R4      SWAPAT
 5603                                           ;R5      LAST
 5604
 5605                                           ;NOTE THE PATTERN STARTS AT MTPB24.
 5606
 5607                                           ;UIPAR'S
 5608 034060  011100                    1$:     MOV     (R1),R0         ;V177640        ;READ 'A'
 5609 034062  020004                            CMP     R0,R4           ;V177642        ;CHECK 'A'
 5610 034064  001401                            BEQ     2$              ;V177644        ;BR IF OK
 5611 034066  104447                            PERR23                  ;V177646        ;REPORT ERROR
 5612
 5613 034070  011200                    2$:     MOV     (R2),R0         ;V177650        ;READ 'B'
 5614 034072  020003                            CMP     R0,R3           ;V177652        ;CHECK 'B'
 5615 034074  001401                            BEQ     3$              ;V177654        ;BR IF OK
 5616 034076  104450                            PERR24                  ;V177656        ;REPORT ERROR
 5617
 5618 034100  062702  000400            3$:     ADD     #400,R2         ;V177660        ;BUMP 'B'
 5619 034104  020205                            CMP     R2,R5           ;V177664        ;AT END YET
 5620 034106  101764                            BLOS    1$              ;V177666        ;BR IF NO
 5621
 5622 034110  062701  000002                    ADD     #2,R1           ;V177670        ;BUMP 'A'
 5623 034114  000137  172260                    JMP     @#SDPAR0        ;V177674        ;GOTO V177260
```

```
5626 034120                          MTPB24: SUBTST  <<MTPB24        FAST GALLOP PART B>>
                                     ;*********************************************************************
                                     ;*SUBTEST        MTPB24  FAST GALLOP PART B
                                     ;*********************************************************************
5627                                         ;SDPAR'S
5628 034120  010411                          MOV     R4,(R1)         ;V172260        ;WRITE 'A'
5629 034122  020105                          CMP     R1,R5           ;V172262        ;DONE?
5630 034124  001001                          BNE     1$              ;V172264        ;BR IF NO
5631 034126  000207                          RETURN                  ;V172266        ;YES - RETURN
5632 034130  000137  172360        1$:       JMP     @#KDPAR0        ;V172270        ;GOTO V172360
5633
5634 034134                          MTPC24: SUBTST  <<MTPC24        FAST GALLOP PART C>>
                                     ;*********************************************************************
                                     ;*SUBTEST        MTPC24  FAST GALLOP PART C
                                     ;*********************************************************************
5635                                         ;KDPAR'S
5636 034134  010102                          MOV     R1,R2           ;V172360        ;RESET 'B' <--- 'A'
5637 034136  011100                          MOV     (R1),R0         ;V172362        ;READ 'A'
5638 034140  020004                          CMP     R0,R4           ;V172364        ;CHECK 'A'
5639 034142  001401                          BEQ     1$              ;V172366        ;BR IF OK
5640 034144  104447                          PERR23                  ;V172370        ;REPORT ERROR
5641 034146  000137  177660        1$:       JMP     @#UDPAR0        ;V172372        ;GOTO V177660
```

```
5645 034152                            MTP025: SUBTST  <<MTP025        INTERRUPT ENABLE TEST>>
                                               ;*****************************************************************
                                               ;*SUBTEST       MTP025  INTERRUPT ENABLE TEST
                                               ;*****************************************************************
5646 034152  005037  002344                     CLR     TSTDAT          ,GENERATE CHECKBITS ON 0,,0
5647 034156  005037  002346                     CLR     TSTDAT+2
5648 034162  012737  002344  002402            MOV     #TSTDAT,SOURCE
5649 034170  004737  040540                     CALL    CHKGEN
5650 034174  012737  000003  002100            MOV     #3,NOPAR                ;SETUP PARITY ACTION
5651 034202  013701  002506                     MOV     TESTADD,R1      ;FIRST TEST ADDRESS
5652 034206  012737  034242  002372            MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
5653 034214  004737  034464                     CALL    MTPA25          ;WRITE DATA & CHECKBITS
5654 034220  104473                            ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
5655 034222  005711                            TST     (R1)            ;ACCESS LOCATIONS FOR DBE TRAPS
5656 034224  005761  000002                     TST     2(R1)
5657                                           ;NONE - GOOD - ACCESS FOR SBE TRAPS
5658 034230  104507                            ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
5659 034232  005711                            TST     (R1)
5660 034234  005761  000002                     TST     2(R1)
5661 034240  000404                            BR      2$              ;NONE - GOOD - SKIP
5662 034242  104426                  1$:       READCSR
5663 034244                                    FATAL   27
     034244  005237  002070                     INC     FATAL$                  ;SET FATAL INDICATOR
     034250  104027                            ERROR   +27
                                               .DSABL  CRF
5664 034252  005237  002344            2$:     INC     TSTDAT          ;CHECK FOR CORRECT ACTION ON SBE'S
5665 034256  004737  034412                     CALL    MTPD25          ;IN ALL 4 BYTES
5666 034262  012737  000400  002344            MOV     #400,TSTDAT
5667 034270  004737  034412                     CALL    MTPD25
5668 034274  005037  002344                     CLR     TSTDAT
5669 034300  005237  002346                     INC     TSTDAT+2
5670 034304  004737  034412                     CALL    MTPD25
5671 034310  012737  000400  002346            MOV     #400,TSTDAT+2
5672 034316  004737  034412                     CALL    MTPD25
5673
5674 034322  005037  002346                     CLR     TSTDAT+2        ;CHECK FOR CORRECT ACTION ON DBE'S
5675 034326  012737  000003  002344            MOV     #3,TSTDAT       ;IN ALL 4 BYTES
5676 034334  004737  034434                     CALL    MTPE25
5677 034340  012737  001400  002344            MOV     #1400,TSTDAT
5678 034346  004737  034434                     CALL    MTPE25
5679 034352  005037  002344                     CLR     TSTDAT
5680 034356  012737  000003  002346            MOV     #3,TSTDAT+2
5681 034364  004737  034434                     CALL    MTPE25
5682 034370  012737  001400  002346            MOV     #1400,TSTDAT+2
5683 034376  004737  034434                     CALL    MTPE25
5684 034402  104503                            CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
5685 034404  005037  002100                     CLR     NOPAR           ;INDICATE PARITY ACTION
5686 034410  000207                            RETURN
5687
5688 034412  004737  034464            MTPD25: CALL    MTPA25          ;WRITE DATA & CHECKBITS
5689 034416  104471                            ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
5690 034420  004737  034504                     CALL    MTPB25          ;CHECK FOR NO TRAPS
5691 034424  104507                            ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
5692 034426  004737  034536                     CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
5693 034432  000207                            RETURN
```

```
 5696 034434  004737  034464          MTPE25: CALL    MTPA25          ;WRITE DATA & CHECKBITS
 5697 034440  104471                          ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5698 034442  004737  034504                  CALL    MTPB25          ;CHECK FOR NO TRAPS
 5699                                         ;ENABLE DBE TRAPS
 5700 034446  104473                          ECC1INIT                ;INITIALIZE 1 SELECTED MK11 CSR
 5701 034450  004737  034536                  CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
 5702 034454  104507                          ENA1SBE                 ;DISABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
 5703 034456  004737  034536                  CALL    MTPC25          ;CHECK FOR EXPECTED TRAP
 5704 034462  000207                          RETURN
 5705
 5706                                         ;WRITE TSTDAT & TSTDAT+2 & CHECKBITS
 5707 034464  104471          MTPA25: ECC1DIS                 ;DISABLE ECC ON 1 SELECTED CSR
 5708 034466  013711  002344                  MOV     TSTDAT,(R1)     ;WRITE FIRST 16 BITS
 5709 034472  104475                          CB1CSR                  ;WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
 5710 034474  013761  002346  000002          MOV     TSTDAT+2,2(R1)  ;WRITE 2ND 16 BITS & CHECKBITS
 5711 034502  000207                          RETURN
 5712
 5713                                         ;CHECK FOR NO TRAP OCCURING CONDITION
 5714 034504  012737  034522  002372  MTPB25: MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
 5715 034512  005711                          TST     (R1)            ;ACCESS LOCATIONS
 5716 034514  005761  000002                  TST     2(R1)
 5717 034520  000207                          RETURN                  ;NO TRAP - GOOD - RETURN
 5718
 5719 034522  104426          1$:     READCSR
 5720 034524  104024                  ERROR   +24
 5721 034526                          SET     HEADER
      034526  012737  177777  002724                                                  MOV   #-1,HEADER
 5722 034534  000207                  RETURN
 5723
 5724                                         ;TRAP SHOULD OCCURE TEST
 5725 034536  012737  034550  002372  MTPC25: MOV     #1$,PARTHERE    ;SETUP TRAP DESTINATION
 5726 034544  005711                          TST     (R1)            ;ACCESS 1ST LOCATION
 5727 034546  000405                          BR      2$              ;NO TRAP - BAD NEWS - SKIP
 5728 034550  012737  034574  002372  1$:     MOV     #3$,PARTHERE    ;SETUP TRAP DESTINATION
 5729 034556  005761  000002                  TST     2(R1)           ;ACCESS 2ND LOCATION
 5730 034562  104426          2$:     READCSR                 ;NO TRAP - BAD NEWS
 5731 034564  104025                  ERROR   +25
 5732 034566                          SET     HEADER
      034566  012737  177777  002724                                                  MOV   #-1,HEADER
 5733 034574  000207          3$:     RETURN
 5734
```

```
5738 034576                          MTPA26: SUBTST  <<MTPA26        RANDOM DATA (WRITE)>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MTPA26  RANDOM DATA (WRITE)
                                     ;*****************************************************************************
5739 034576  000137  172360          1$:     JMP     KDPAR0          ;V177640        GOTO V172360
5740 034602  010221                          MOV     R2,(R1)+        ;V177644
5741 034604  010321                          MOV     R3,(R1)+        ;V177646
5742 034606  077005                          SOB     R0,1$           ;V177650
5743 034610  000207                          RETURN                  ;V177652
5744
5745 034612                          MTPB26: SUBTST  <<MTPB26        RANDOM DATA (READ)>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        MTPB26  RANDOM DATA (READ)
                                     ;*****************************************************************************
5746                                         .DSABL  AMA
5747                                         .ENABL  LSB
5748 034612  000137  172360          1$:     JMP     @#KDPAR0        ;V177640        GOTO V172360
5749 034616  020221                          CMP     R2,(R1)+        ;V177644
5750 034620  001401                          BEQ     2$              ;V177646
5751 034622  104451                          PERR25                  ;V177650
5752 034624  005127                  2$:     COM     (PC)+           ;V177652
5753 034626  000000                  RANODD: 0                       ;V177654        FOR ERROR REPORTING
5754 034630  020321                          CMP     R3,(R1)+        ;V177656
5755 034632  001401                          BEQ     3$              ;V177660
5756 034634  104451                          PERR25                  ;V177662
5757 034636  005167  177764          3$:     COM     RANODD          ;V177664
5758 034642  077015                          SOB     R0,1$           ;V177670
5759 034644  000207                          RETURN                  ;V177672
5760                                         .DSABL  LSB
5761                                         .ENABL  AMA
5762
5763 034646                          MTPC26: SUBTST  <<RANDOM NUMBER SUBPROGRAM>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        RANDOM NUMBER SUBPROGRAM
                                     ;*****************************************************************************
5764                                         ;CALLER MUST SETUP
5765                                         ;       MOV     SEEDLO,R3
5766                                         ;       MOV     SEEDHI,R2
5767                                         ;       MOV     R3,R5
5768                                         ;       MOV     R2,R4
5769 034646  073427  000007                  ASHC    #7,R4           ;V172360
5770 034652  060305                          ADD     R3,R5           ;V172364
5771 034654  005504                          ADC     R4              ;V172366
5772 034656  060204                          ADD     R2,R4           ;V172370
5773 034660  062705  001057                  ADD     #1057,R5        ;V172372
5774 034664  000730                          BR      .-116           ;V172376        GOTO V172260
5775
5776 034666                          MTPD26: SUBTST  <<RANDOM NUMBER SUBSUBPROGRAM>>
                                     ;*****************************************************************************
                                     ;*SUBTEST        RANDOM NUMBER SUBSUBPROGRAM
                                     ;*****************************************************************************
5777 034666  005504                          ADC     R4              ;V172260
5778 034670  062704  047401                  ADD     #47401,R4       ;V172262
5779 034674  010503                          MOV     R5,R3           ;V172266
5780 034676  010402                          MOV     R4,R2           ;V172270
5781 034700  000137  177644                  JMP     JIPAR2          ;V172272        GOTO V177644
```

```
 5784 034704                            MTP030: SUBTST  <<MT0030        FLUSH OUT DBE'S>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MT0030  FLUSH OUT DBE'S
                                        ;*****************************************************************************
 5785 034704  011002                    1$:     MOV     (R0),R2         ;V177640
 5786 034706  010220                            MOV     R2,(R0)+        ;V177642
 5787 034710  077103                            SOB     R1,1$           ;V177644
 5788 034712  000207                            RETURN                  ;V177646
 5789
 5790 034714                            MTP031: SUBTST  <<MTP031        SOB-A-LONG TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MTP031  SOB-A-LONG TEST
                                        ;*****************************************************************************
 5791                                           .DSABL  AMA
 5792 034714  000000                            0                       ;MOVE TERMINATOR
 5793 034716  077001                    1$:     SOB     R0,1$           ;SOB TILL R0 UNDERFLOWS
 5794 034720  005167  177772                    COM     1$              ;WRITE COMPLEMENT OF SOB
 5795 034724  020167  177766                    CMP     R1,1$           ;READ & CHECK FOR NOT "SOB R0,DOT"
 5796 034730  001403                            BEQ     2$              ;OK - SKIP
 5797 034732  104454                            PERR30
 5798 034734  010167  177756                    MOV     R1,1$
 5799 034740  005167  177752            2$:     COM     1$              ;CORRECT SOB INSTRUCTION
 5800 034744  010200                            MOV     R2,R0           ;REINITIALIZE SOB CONSTANT
 5801                                           ;UPDATE MOVE REGISTERS
 5802 034746  010503                            MOV     R5,R3
 5803 034750  005725                            TST     (R5)+           ;BUMP (SAFELY) BY 2
 5804 034752  010504                            MOV     R5,R4
 5805 034754  020527  160000                    CMP     R5,#LAST+2      ;DONE?
 5806 034760  001001                            BNE     3$              ;NO - SKIP
 5807 034762  000207                            RETURN                  ;YES
 5808
 5809 034764  014344                    3$:     MOV     -(R3),-(R4)
 5810 034766  001376                            BNE     3$
 5811 034770  000752                            BR      1$
 5812         000056                    SOBLENGTH=.-MTP031
 5813                                           .ENABL  AMA
```

```
5816 034772                          MTPA32: SUBTST  <<MTPA32        SKEWED UP ADDRESS TEST (WRITE)>>
                                     ;*********************************************************************************
                                     ;*SUBTEST        MTPA32  SKEWED UP ADDRESS TEST (WRITE)
                                     ;*********************************************************************************
5817 034772  062704  000006          1$:     ADD     #6,R4           ;V177640        ;ADD OFFSET TO OFFSET COUNTER
5818 034776  042704  177771                  BIC     #^C6,R4         ;V177644        ;MASK TO (0,2,4,6)
5819 035002  010301                          MOV     R3,R1           ;V177650        ;PUT IN LSB'S OF ADDRESS
5820 035004  060401                          ADD     R4,R1           ;V177652        ;PUT IN MSB'S OF ADDRESS
5821 035006  010011                          MOV     R0,(R1)         ;V177654        ;WRITE DATA IN R0 INTO MEMORY
5822 035010  062703  000010                  ADD     #10,R3          ;V177656        ;BUMP ADDRESS MSB TO NEXT BLOCK OF 4 WORDS
5823 035014  077512                          SOB     R5,1$           ;V177662        ;LOOP TILL DONE
5824 035016  000207                          RETURN                  ;V177664
5825
5826 035020                          MTPB32: SUBTST  <<MTPB32        SKEWED UP ADDRESS TEST (READ)>>
                                     ;*********************************************************************************
                                     ;*SUBTEST        MTPB32  SKEWED UP ADDRESS TEST (READ)
                                     ;*********************************************************************************
5827 035020  062704  000006          1$:     ADD     #6,R4           ;V177640        ;ADD OFFSET TO OFFSET COUNTER
5828 035024  042704  177771                  BIC     #^C6,R4         ;V177644        ;MASK TO (0,2,4,6)
5829 035030  010301                          MOV     R3,R1           ;V177650        ;PUT IN LSB'S OF ADDRESS
5830 035032  060401                          ADD     R4,R1           ;V177652        ;PUT IN MSB'S OF ADDRESS
5831 035034  011102                          MOV     (R1),R2         ;V177654        ;READ DATA INTO R0
5832 035036  020200                          CMP     R2,R0           ;V177656        ;IS IT CORRECT?
5833 035040  001401                          BEQ     2$              ;V177660        ;YES - SKIP
5834 035042  104446                          PERR22                  ;V177662        ;NO - PRINT ERROR
5835 035044  062703  000010          2$:     ADD     #10,R3          ;V177664        ;BUMP ADDRESS MSB TO NEXT BLOCK OF 4 WORDS
5836 035050  077515                          SOB     R5,1$           ;V177666        ;LOOP TILL DONE
5837 035052  000207                          RETURN                  ;V177670
5838
5839 035054                          MTP033: SUBTST  <<MTP033        WRITE RECOVERY TEST>>
                                     ;*********************************************************************************
                                     ;*SUBTEST        MTP033  WRITE RECOVERY TEST
                                     ;*********************************************************************************
5840                                         ;THE TEST ACTUALLY EXECUTED ALREADY IN THE MEMORY UNDER TEST.
5841                                         ;THIS CODE INSURES THAT IT CHANGED MEMORY TO HAVE
5842                                         ;1/2 BANK OF #5141      WHICH IS A "COM -(R1)" INSTRUCTION AND
5843                                         ;1/2 BANK OF #110       WHICH IS A "JMP (R0)"   INSTRUCTION.
5844
5845 035054  012401                  1$:     MOV     (R4)+,R1        ;V177640        ;GET DATA FROM LOWER 1/2 BANK
5846 035056  020102                          CMP     R1,R2           ;V177642        ;IS IT #5141?
5847 035060  001401                          BEQ     2$              ;V177644        ;YES - SKIP
5848 035062  104430                          PERR02                  ;V177646        ;NO - TAKE ERROR TRAP
5849 035064  077305                  2$:     SOB     R3,1$           ;V177650        ;LOOP FOR 1/2 BANK
5850 035066  012703  020000                  MOV     #SIZE/2,R3      ;V177652        ;RESTORE LOOP SIZE
5851 035072  012400                  3$:     MOV     (R4)+,R0        ;V177656        ;GET DATA FROM UPPER 1/2 BANK
5852 035074  020005                          CMP     R0,R5           ;V177660        ;IS IT #110?
5853 035076  001401                          BEQ     4$              ;V177662        ;YES - SKIP
5854 035100  104427                          PERR01                  ;V177664        ;NO- TAKE ERROR TRAP
5855 035102  077305                  4$:     SOB     R3,3$           ;V177666        ;LOOP FOR 1/2 BANK
5856 035104  000207                          RETURN
```

```
 5859 035106                            MTP034: SUBTST  <<MTP034        BRANCH GOBBLE TEST>>
                                        ;*******************************************************************************
                                        ;*SUBTEST        MTP034  BRANCH GOBBLE TEST
                                        ;*******************************************************************************
 5860                                           .DSABL  AMA
 5861 035106  000000                            0                       ;MOVE TERMINATOR
 5862 035110  000000                    BGTEST: 0                       ;TEST WORD (TWO BYTES)
 5863 035112  000261                    BRGOBB: SEC                     ;SET CARRY (TO BE ADDED TO 'BGTEST')
 5864 035114  105511                            ADCB    (R1)            ;INCREMENT LOW BYTE OF 'BGTEST'
 5865 035116  100402                            BMI     1$              ;BRANCH WHEN BIT7 IS SET
 5866 035120  105212                            INCB    (R2)            ;INCREMENT HIGH BYTE OF 'BGTEST'
 5867 035122  000773                            BR      BRGOBB          ;LOOP 128 TIMES
 5868
 5869                                           ;NOW CHECK FOR CORRECT CONDITION CODES
 5870 035124  102401                    1$:     BVS     2$              ;BR IF V-BIT SET (SHOULD BE
 5871 035126  104461                            PERR35                  ;NO - REPORT ERROR AND ABORT TEST
 5872                                                                   ;COND CODES NOT EQUAL TO 1010
 5873 035130  000242                    2$:     CLV                     ;CLEAR V-BIT
 5874 035132  105212                            INCB    (R2)            ;INCREMENT HIGH BYTE OF 'BGTEST' ONCE MORE
 5875 035134  103402                            BCS     3$              ;BR IF C-BIT SET (SHOULD NOT BE)
 5876 035136  102001                            BVC     3$              ;BR IF V-BIT CLEAR (SHOULD NOT BE)
 5877 035140  100401                            BMI     4$              ;BR IF N-BIT SET (SHOULD BE)
 5878 035142  104461                    3$:     PERR35                  ;NO - REPORT ERROR AND ABORT TEST
 5879                                                                   ;COND CODES NOT EQUAL TO 1010
 5880
 5881                                           ;UPDATE TEST POINTERS
 5882 035144  010701                    4$:     MOV     PC,R1
 5883 035146  162701  000036            5$:     SUB     #5$-BGTEST,R1
 5884 035152  010102                            MOV     R1,R2
 5885 035154  005202                            INC     R2
 5886
 5887                                           ;UPDATE MOVE REGISTERS
 5888 035156  010503                            MOV     R5,R3
 5889 035160  005725                            TST     (R5)+           ;BUMP (SAFELY) BY 2
 5890 035162  010504                            MOV     R5,R4
 5891
 5892                                           ;DONE?
 5893 035164  020527  160000                    CMP     R5,#LAST+2      ;DONE?
 5894 035170  001001                            BNE     6$              ;NO - SKIP
 5895 035172  000207                            RETURN                  ;YES - RETURN
 5896
 5897                                           ;MOVE CODE 1 LOCATION
 5898 035174  014344                    6$:     MOV     -(R3),-(R4)
 5899 035176  001376                            BNE     6$
 5900 035200  005011                            CLR     (R1)            ;CLEAR TEST WORD 'BGTEST'
 5901 035202  000743                            BR      BRGOBB          ;RUN MOVED CODE AGAIN
 5902         000076                    GBLENGTH=.-MTP034
 5903                                           .ENABL  AMA
```

```
                                        .SBTTL  MISC SUBROUTINES

035204                          REGCOPY:SUBTST  <<SUBR  COPY R0 TO R4,R1 TO R3, & R2 TO R5>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    COPY R0 TO R4,R1 TO R3, & R2 TO R5
                                ;*****************************************************************************
035204  010004                          MOV     R0,R4
035206  010103                          MOV     R1,R3
035210  010205                          MOV     R2,R5
035212  000207                          RETURN

035214                          FLIPWARN:SUBTST <<FLIP WARNING CONSTANTS IN WORST CASE NOISE TESTS>>
                                ;*****************************************************************************
                                ;*SUBTEST        FLIP WARNING CONSTANTS IN WORST CASE NOISE TESTS
                                ;*****************************************************************************
035214                                  PUSH    R0
035214  010046                                                                  MOV R0,-(SP)
035216  005237  002734                  INC     FLIPLOC
035222  042737  177774  002734          BIC     #^C3,FLIPLOC
035230  022737  000001  002734          CMP     #1,FLIPLOC
035236  001414                          BEQ     1$
035240  022737  000002  002734          CMP     #2,FLIPLOC
035246  001413                          BEQ     2$
035250  022737  000003  002734          CMP     #3,FLIPLOC
035256  001414                          BEQ     3$
035260  005000                          CLR     R0
035262  013704  002726                  MOV     ONES,R4
035266  000414                          BR      4$
035270                          1$:     CLEAR   R0,R4
035270  005000                                                                  CLR  R0
035272  005004                                                                  CLR  R4
035274  000411                          BR      4$
035276  012700  000401          2$:     MOV     #401,R0
035302  013704  002726                  MOV     ONES,R4
035306  000404                          BR      4$
035310  012700  000401          3$:     MOV     #401,R0
035314  012704  000401                  MOV     #401,R4
035320  010037  026522          4$:     MOV     R0,WARN2
035324  010037  026536                  MOV     R0,WARN3
035330  010037  026562                  MOV     R0,WARN4
035334  010037  026576                  MOV     R0,WARN5
035340                                  POP     R0
035340  012600                                                                  MOV (SP)+,R0
035342  000207                          RETURN

035344                          BACKGND:SUBTST  <<SUBR  WRITE BACKGROUND>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    WRITE BACKGROUND
                                ;*****************************************************************************
                                        ;WRITES DATA FROM R2
035344  104415                          SAVREG
035346  012700  060000                  MOV     #FIRST,R0
035352  012701  040000                  MOV     #SIZE,R1
035356                                  BMOV    MTP000
035356  004537  043710                      JSR R5,BLOCK1
035362  026376                          MTP000
                                        .DSABL      CRF
```

```
 5946 035364  012737  000207  177644  WARN6:  MOV     #207,UIPAR2          ;WARNING PUTTING 'RETURN' INSTRUCTION AFTER WRITE
 5947 035372  004737  026042                  CALL    SUPD01
 5948 035376  104416                          RESREG
 5949 035400  000207                          RETURN
```

```
 5953 035402                                PCONFIG:SUBTST  <<SUBR  PRINT CONFIGURATION MAP>>
                                            ;*****************************************************************
                                            ;*SUBTEST       SUBR    PRINT CONFIGURATION MAP
                                            ;*****************************************************************
 5954 035402                                        PUSH    TKVEC,TKVEC+2,R0
      035402  013746  000060                                                            MOV TKVEC,-(SP)
      035406  013746  000062                                                            MOV TKVEC+2,-(SP)
      035412  010046                                                                    MOV R0,-(SP)
 5955 035414  010637  035662                        MOV     SP,PCONFS               ;SAVE LAST GOOD SP
 5956 035420  012737  035630  000060                MOV     #PCONF2,TKVEC
 5957 035426  012737  000340  000062                MOV     #340,TKVEC+2
 5958 035434  017700  145334                        MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
 5959 035440  042737  000200  177776                BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
 5960 035446  052777  000100  145316                BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
 5961
 5962 035454                                        TYPE    MSG001
      035454  104401  111254                        TYPEIT  ,MSG001
                                                    .DSABL  CRF
 5963 035460                                        TYPE    MSG002
      035460  104401  111336                        TYPEIT  ,MSG002
                                                    .DSABL  CRF
 5964 035464                                        TYPE    MSG003
      035464  104401  111413                        TYPEIT  ,MSG003
                                                    .DSABL  CRF
 5965                                               ;IF FAT PAPER ON TERMINAL GOTO 1$
 5966 035470                                        IF #SW4 SET.IN @SWR THEN JUMPTO PCONF1
      035470  032777  000020  145270                                                    BIT #SW4,@SWR
      035476  001402                                                                   BEQ L411
      035500  000137  035572                                                          JMP PCONF1
      035504                                                                    L411:::::::
 5967 035504  012700  000074                        MOV     #60.,R0
 5968 035510  010004                                MOV     R0,R4
 5969 035512                                        CLEAR   R1,R3
      035512  005001                                                                   CLR  R1
      035514  005003                                                                   CLR  R3
 5970 035516                                        TYPE    MSG004
      035516  104401  111520                        TYPEIT  ,MSG004
                                                    .DSABL  CRF
 5971 035522  004737  035664                        CALL    TCONFIG                 ;GO TYPE CONFIGURATION (1ST HALF)
 5972 035526                                        TYPE    $CRLF
      035526  104401  003010                        TYPEIT  ,$CRLF
                                                    .DSABL  CRF
 5973 035532                                        TYPE    MSG017                  ;PRINT SPACE(S)
      035532  104401  112150                        TYPEIT  ,MSG017
                                                    .DSABL  CRF
 5974 035536                                        TYPE    MSG011
      035536  104401  111745                        TYPEIT  ,MSG011
                                                    .DSABL  CRF
 5975 035542                                        TYPE    $CRLF
      035542  104401  003010                        TYPEIT  ,$CRLF
                                                    .DSABL  CRF
 5976 035546                                        TYPE    MSG017                  ;PRINT SPACE(S)
      035546  104401  112150                        TYPEIT  ,MSG017
                                                    .DSABL  CRF
 5977 035552                                        TYPE    MSG012
      035552  104401  112033                        TYPEIT  ,MSG012
                                                    .DSABL  CRF
```

```
 5978 035556  012701  000550            MOV     #60.*2*3,R1
 5979 035562  010103                    MOV     R1,R3
 5980 035564  004737  035664            CALL    TCONFIG
 5981 035570  000417                    BR      PCONF2
 5982
 5983 035572  012700  000170  PCONF1:   MOV     #120.,R0
 5984 035576  010004                    MOV     R0,R4
 5985 035600                            CLEAR   R1,R3
      035600  005001                                                    CLR  R1
      035602  005003                                                    CLR  R3
 5986 035604                            TYPE    MSG014                ;SPACE
      035604  104401  112132            TYPEIT  ,MSG014
                                        .DSABL  CRF
 5987 035610                            TYPE    MSG011
      035610  104401  111745            TYPEIT  ,MSG011
                                        .DSABL  CRF
 5988 035614                            TYPE    MSG004
      035614  104401  111520            TYPEIT  ,MSG004
                                        .DSABL  CRF
 5989 035620                            TYPE    MSG012
      035620  104401  112033            TYPEIT  ,MSG012
                                        .DSABL  CRF
 5990 035624  004737  035664            CALL    TCONFIG
 5991
 5992 035630  013706  035662  PCONF2:   MOV     PCONFS,SP             ;RESTORE STACK
 5993 035634  042777  000100  145130    BIC     #BIT6,@$TKS
 5994 035642  117700  145126            MOVB    @$TKB,R0              ;READ CHAR TO KILL FLAG
 5995 035646                            POP     R0,TKVEC+2,TKVEC
      035646  012600                                                    MOV (SP)+,R0
      035650  012637  000062                                            MOV (SP)+,TKVEC+2
      035654  012637  000060                                            MOV (SP)+,TKVEC
 5996 035660  000207                    RETURN
 5997
 5998 035662  000000  PCONFS:  0                                       ;STACK SAVED HERE!
```

```
                                        SUBTST  <<SUBR  TYPE CONFIGURATION>>
                                ;*******************************************************************************
                                ;*SUBTE          SUBR    TYPE CONFIGURATION
                                ;*******************************************************************************
                                ;*******************************************************************************
                                ;CALL:   MOV     #N,R0           ;N=NUMBER OF CHARACTERS
                                ;       MOV     R0,R4           ;BACKUP
                                ;       MOV     #K,R1           ;INDEX CONSTANT
                                ;       MOV     R1,R3           ;BACKUP
                                ;       CALL    TCONFIG         ;ACTUAL CALL
                                ;       RETURN                  ;ONLY RETURN
                                ;*******************************************************************************

                                        ;***********
                                        ;** ERROR **
                                        ;***********
035664                          TCONFIG:TYPE    MSG005
035664  104401  111626                  TYPEIT  ,MSG005
                                        .DSABL  CRF
035670  032761  004000  003016  1$:     BIT     #BIT11,CONFIG(R1)       ;ERROR ON THIS BANK?
035676  001403                          BEQ     2$                      ;NO - SKIP
035700                                  TYPE    MSG013                  ;PRINT "X"
035700  104401  112130                  TYPEIT  ,MSG013
                                        .DSABL  CRF
035704  000402                          BR      3$
035706                          2$:     TYPE    MSG014                  ;PRINT SPACE
035706  104401  112132                  TYPEIT  ,MSG014
                                        .DSABL  CRF
035712  062701  000006          3$:     ADD     #6,R1                   ;BUMP POINTER
035716  077014                          SOB     R0,1$                   ;LOOP TILL DONE
035720  010400                          MOV     R4,R0
035722  010301                          MOV     R3,R1

                                        ;***********
                                        ;** CPU'S **
                                        ;***********
035724                                  TYPE    MSG008
035724  104401  111707                  TYPEIT  ,MSG008
                                        .DSABL  CRF
035730  016105  003016          4$:     MOV     CONFIG(R1),R5
035734  072527  177774                  ASH     #-4,R5                  ;GET CPU BITS
035740  042705  177760                  BIC     #^C17,R5                ;CLEAR NON INTERESTING BITS
035744  022705  000012                  CMP     #10.,R5
035750  100003                          BPL     8$
035752  062705  000067                  ADD     #67,R5                  ;MAKE NUMBERS OVER 9 HEX
035756  000402                          BR      9$
035760  062705  000060          8$:     ADD     #60,R5                  ;MAKE ASCII
035764  110537  112134          9$:     MOVB    R5,MSG015               ;PLUG INTO MEMORY
035770                                  TYPE    MSG015
035770  104401  112134                  TYPEIT  ,MSG015
                                        .DSABL  CRF
035774  062701  000006                  ADD     #6,R1                   ;BUMP POINTER
036000  077025                          SOB     R0,4$                   ;LOOP TILL DONE
036002  010400                          MOV     R4,R0
036004  010301                          MOV     R3,R1
```

```
                                        ;*****************
                                        ;** INTERLEAVE **
                                        ;*****************
                                        TYPE    MSG007
036006  104401  111675                  TYPEIT  ,MSG007
                                        .DSABL  CRF
                                        ;THIS IS AN ENTRY POINT FROM ERROR REPORTS
036012  016105  003016          TCFIG1: MOV     CONFIG(R1),R5
036016  072527  177763                  ASH     #-13.,R5                ;GET MEMORY TYPE
036022  042705  177774                  BIC     #^C3,R5                 ;CLEAR NON INTERESTING BITS
036026  005705                          TST     R5
036030  001004                          BNE     1$
036032  112737  000077  112134          MOVB    #'?,MSG015
036040  000435                          BR      7$
036042  016105  003016          1$:     MOV     CONFIG(R1),R5
036046  042705  177770                  BIC     #^C7,R5                 ;GET INTERLEAVE BITS
036052  022705  000001                  CMP     #1,R5
036056  001002                          BNE     2$
036060  006305                          ASL     R5                      ;2 TO 1
036062  000420                          BR      5$
036064  022705  000002          2$:     CMP     #2,R5
036070  001002                          BNE     3$
036072  006305                          ASL     R5                      ;4 TO 1
036074  000413                          BR      5$
036076  022705  000004          3$:     CMP     #4,R5
036102  001003                          BNE     4$
036104  012705  000010                  MOV     #8.,R5                  ;8 TO 1
036110  000405                          BR      5$
036112  005705                  4$:     TST     R5
036114  001403                          BEQ     5$
036116  012705  000077                  MOV     #'?,R5
036122  000402                          BR      6$
036124  062705  000060          5$:     ADD     #60,R5                  ;MAKE ASCII
036130  110537  112134          6$:     MOVB    R5,MSG015               ;PLUG INTO MEMORY
036134                          7$:     TYPE    MSG015
036134  104401  112134                  TYPEIT  ,MSG015
                                        .DSABL  CRF
036140                                  IF NOTAB NE #0 THEN $RETURN
036140  005737  002464                                                  TST NOTAB
036144  001401                                                          BEQ L412
036146  000207                                                          RTS PC
036150                                                          L412::::::
036150  062701  000006                  ADD     #6,R1                   ;BUMP POINTER
036154  077062                          SOB     R0,TCFIG1               ;LOOP TILL DONE
036156  010400                          MOV     R4,R0
036160  010301                          MOV     R3,R1

                                        ;*****************
                                        ;** MEMORY TYPE **
                                        ;*****************
                                        .ENABL  LSB
036162                                  TYPE    MSG009
036162  104401  111721                  TYPEIT  ,MSG009
                                        .DSABL  CRF
036166  016105  003016          8$:     MOV     CONFIG(R1),R5
036172  072527  177763                  ASH     #-13.,R5                ;GET MEMORY TYPE
036176  042705  177774                  BIC     #^C3,R5                 ;CLEAR NON INTERESTING BITS
```

```
                                        IF R5 EQ #1
                                                                                        CMP R5,#1
                                                                                        BNE L413
6094 036210 112737 000113 112134          MOVB  #'K,MSG015
6095 036216                             ELSE
     036216 000413                                                                      BR L414
     036220                                                                     L413:::::::
6096 036220                               IF #SLAVE3.SLAVE2!SLAVE1.MASTER SET.IN CONFIG(R1)
     036220 032761 000360 003016                                                        BIT #SLAVE3 SLAVE2 SLAVE1 MA
     036226 001404                                                                      BEQ L415
6097 036230 112737 000112 112134            MOVB        #'J,MSG015
6098 036236                               ELSE
     036236 000403                                                                      BR L416
     036240                                                                     L415:::::::
6099 036240 112737 000060 112134            MOVB        #'0,MSG015
6100 036246                               END ;OF IF #SLAVE3!SLAVE2'SLAVE1!MASTER
     036246                                                                     L416:::::::
6101 036246                             END ;OF IF R5
     036246                                                                     L414:::::::
6102 036246                             TYPE    MSG015
     036246 104401 112134               TYPEIT  ,MSG015
                                        .DSABL  CRF
6103 036252 062701 000006               ADD     #6,R1                   ;BUMP POINTER
6104 036256 077035                      SOB     R0,8$                   ;LOOP TILL DONE
6105 036260 010400                      MOV     R4,R0
6106 036262 010301                      MOV     R3,R1
6107                                    .DSABL  LSB
6108
6109                                    ;*********
6110                                    ;** BOX **
6111                                    ;*********
6112 036264                             TYPE    MSG016
     036264 104401 112136               TYPEIT  ,MSG016
                                        .DSABL  CRF
6113 036270 016105 003016          9$:  MOV     CONFIG(R1),R5
6114 036274 032705 000010               BIT     #BIT3,R5                ;EXTERNAL INTERLEAVE?
6115 036300 001404                      BEQ     10$                     ;NO - SKIP
6116 036302 112737 000115 112134        MOVB    #'M,MSG015              ;INDICATE MULTIPLE BOXES
6117 036310 000417                      BR      12$
6118 036312 032705 020014          10$: BIT     #BIT13!14,R5            ;MJ11?
6119 036316 001004                      BNE     11$                     ;NO - SKIP
6120 036320 112737 000077 112134        MOVB    #'?,MSG015              ;I DON'T KNOW HOW MJ11'S INTERLEAVE
6121 036326 000410                      BR      12$
6122 036330 072527 177770          11$: ASH     #-8.,R5                 ;GET BOX NUMBER
6123 036334 042705 177774               BIC     #^C3,R5                 ;CLEAR NON INTERESTING BITS
6124 036340 062705 000060               ADD     #60,R5                  ;MAKE ASCII
6125 036344 110537 112134               MOVB    R5,MSG015               ;PLUG INTO MEMORY
6126 036350                        12$: TYPE    MSG015
     036350 104401 112134               TYPEIT  ,MSG015
                                        .DSABL  CRF
6127 036354 062701 000006               ADD     #6,R1                   ;BUMP POINTER
6128 036360 077035                      SOB     R0,9$                   ;LOOP TILL DONE
6129 036362 010400                      MOV     R4,R0
6130 036364 010301                      MOV     R3,R1
6131
6132                                    ;***************
6133                                    ;** PROTECTED **
```

```
.IBR    TYPE CONFIGURATION

 6134                                                  ;***************
 6135 036366                                    TYPE    MSG010
      036366  104401  111733                    TYPEIT  ,MSG010
                                                .DSABL  CRF
 6136 036372  005761  003016          13$:      TST     CONFIG(R1)          ;BANK PROTECTED?
 6137 036376  100004                            BPL     14$                 ;NO - SKIP
 6138 036400  112737  000120  112134           MOVB    #'P,MSG015
 6139 036406  000407                            BR      15$
 6140 036410  032761  010000  003016  14$:      BIT     #BIT12,CONFIG(R1)   ;PROTECTED REGION OF MK11 BOX?
 6141 036416  001406                            BEQ     16$                 ;NO - SKIP
 6142 036420  112737  000113  112134           MOVB    #'K,MSG015
 6143 036426                            15$:    TYPE    MSG015
      036426  104401  112134                    TYPEIT  ,MSG015
                                                .DSABL  CRF
 6144 036432  000402                            BR      17$
 6145 036434                            16$:    TYPE    MSG014              ;PRINT SPACE
      036434  104401  112132                    TYPEIT  ,MSG014
                                                .DSABL  CRF
 6146 036440  062701  000006          17$:      ADD     #6,R1               ;BUMP POINTER
 6147 036444  077026                            SOB     R0,13$              ;LOOP TILL DONE
 6148 036446  010400                            MOV     R4,R0
 6149 036450  010301                            MOV     R3,R1
 6150 036452  000207                            RETURN
```

```
                                        .SBTTL  TRAP    PARITY ERROR HANDLER
                                ;*******************************************************************************
                                ;VECTOR TO HERE FROM TRAPS TO 114
                                ;IGNORE ERRORS BUT COUNT IF NOPAR FLAG - 1.
                                ;*******************************************************************************
                                ;
                                ;       CODE    ACTION
                                ;
                                ;       --0--   PRINT "UNEXPECTED PARITY TRAP
                                ;         1     COUNT ERROR & SAVE 1ST IN 'PADDRESS'
                                ;         2     SET 'ABORT' / SETUP 'BADPC' / RETURN VIA PCBUMP
                                ;         3     RETURN VIA 'PARTHERE'
                                ;         4     COUNT ERROR & SAVE 1ST IN 'PADDRESS' REGARDLESS OF ERROR REGISTER
                                ;
036454  022737  000001  002100  PARITY: CMP     #1,NOPAR                ;COUNTING PARITY ERRORS?
036462  001023                          BNE     3$                      ;NO - SKIP
036464  032737  000001  177744          BIT     #BIT0,MEMERR            ;MEMORY TIMEOUT?
036472  001402                          BEQ     1$                      ;NO - SKIP
036474  000137  036646                  JMP     NONEXIST                ;YES - SIMULATE A TRAP TO 4
036500  005237  002074          1$:     INC     PARCNT                  ;PARITY ERROR COUNTER + 1
036504  022737  000001  002074          CMP     #1,PARCNT               ;FIRST PARITY ERROR?
036512  001003                          BNE     2$                      ;NO - SKIP
036514  013737  177740  002042          MOV     LOADRS,PADDRESS         ;SAVE 1ST BAD PARITY ADDRESS
036522  013737  177744  177744  2$:     MOV     MEMERR,MEMERR           ;CLEAR ERROR BITS
036530  000002                          RTI
036532  022737  000002  002100  3$:     CMP     #2,NOPAR                ;ACTION CODE = 2 ?
036540  001016                          BNE     6$                      ;NO - SKIP
036542                                  SET     ABORTFLAG               ;YES
        036542  012737  177777  002142                                                  MOV  #-1,ABORTFLAG
036550  004737  036770                  CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036554  063716  002406                  ADD     PCBUMP,(SP)             ;UPDATE RETURN PC
036560  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR ERROR BITS
036566  042766  000004  000002          BIC     #BIT2,2(SP)             ;SHOW FAILURE BY .NE.
036574  000002                          RTI
036576  022737  000003  002100  6$:     CMP     #3,NOPAR                ;ACTION CODE - 3 ?
036604  001006                          BNE     7$                      ;NO - SKIP
036606  013716  002372                  MOV     PARTHERE,(SP)
036612  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR ERROR BITS
036620  000002                          RTI
036622  022737  000004  002100  7$:     CMP     #4,NOPAR
036630  001001                          BNE     8$
036632  000722                          BR      1$
                                ;
036634  004737  036770          8$:     CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036640                                  FATAL   32
        036640  005237  002070                  INC     FATAL$          ;SET FATAL INDICATOR
        036644  104032                  ERROR   +32
                                        .DSABL  CRF
```

```
                                        .SBTTL  TRAP    NON-EXISTANT MEMORY (HOLES) HANDLER
                                ;*******************************************************************
                                ;VECTOR TO HERE (SOMETIMES) FROM TRAPS TO 4
                                ;       CODE IN NONEM DETERMINES ACTION AS FOLLOWS:
                                ; 1)    IGNORE ERRORS BUT COUNT IF NONEM (NO NON-EXISTANT MEMORY) FLAG = 1.
                                ; 2)    TO EXIT PATTERN 0 DURING SIZING IF NON-EXIST MEM ERROR
                                ;*******************************************************************

036646  022737  000001  002102  NONEXIST:CMP     #1,NONEM                ;COUNTING NON-EXISTANT MEMORY ERRORS?
036654  001014                          BNE     2$                      ;NO - SKIP
036656  005237  002072                  INC     NEMCNT                  ;BUMP NON-EXISTANT MEMORY COUNTER
036662  022737  000001  002072          CMP     #1,NEMCNT               ;FIRST ERROR?
036670  001005                          BNE     1$                      ;NO - SKIP
036672  010037  002040                  MOV     R0,ADDRESS              ;ASSUME R0 CONTAINS THE ADDRESS ACCESSED
036676  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR OUT HIADRS & LOADRS REG'S
036704  000002                  1$:     RTI
036706  005237  002072          2$:     INC     NEMCNT                  ;BUMP NON-EXISTANT MEMORY COUNTER
036712  012701  000001                  MOV     #1,R1                   ;DUMMY UP R1 FOR A FORCED SOB EXIT
036716  013737  177744  177744          MOV     MEMERR,MEMERR           ;CLEAR OUT HIADRS & LOADRS REG'S
036724  000002                          RTI

                                ;*******************************************************************
                                        .SBTTL  TRAP    TIMEOUT (TRAP TO 4) HANDLER
036726  004737  036770          TIMEOUT:CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036732                                  FATAL   6
036732  005237  002070                  INC     FATAL$                  ;SET FATAL INDICATOR
036736  104006                          ERROR   +6
                                        .DSABL  CRF
                                ;*******************************************************************
                                        .SBTTL  TRAP    MEMORY MANAGEMENT (TRAP TO 250) HANDLER
036740  004737  036770          MMTRAP: CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036744                                  FATAL   7
036744  005237  002070                  INC     FATAL$                  ;SET FATAL INDICATOR
036750  104007                          ERROR   +7
                                        .DSABL  CRF
                                        .SBTTL  TRAP    RESERVED INSTRUCTION HANDLER
036752  004737  036770          PDP1105:CALL    BADSTACK                ;FIND BAD SP,PC,PSW OFF STACK
036756                                  FATAL   5
036756  005237  002070                  INC     FATAL$                  ;SET FATAL INDICATOR
036762  104005                          ERROR   +5
                                        .DSABL  CRF

036764                          IITRAP: SUBTST  <<UNEXPECTED IIST TRAP HANDLER>>
                                ;*******************************************************************
                                ;*SUBTEST       UNEXPECTED IIST TRAP HANDLER
                                ;*******************************************************************
036764  104057                          ERROR   +57
036766  000002                          RTI

036770                          BADSTACK:SUBTST <<FIND BAD SP, PC, & PSW FROM STACK>>
                                ;*******************************************************************
                                ;*SUBTEST       FIND BAD SP, PC, & PSW FROM STACK
                                ;*******************************************************************
036770  010637  002032                  MOV     SP,BADSP
036774  062737  000002  002032          ADD     #2,BADSP
037002  016637  000002  002026          MOV     2(SP),BADPC
037010  016637  000004  002036          MOV     4(SP),BADPSW
```

FIND BAD SP, PC, & PSW FROM STACK

```
6242 037016  000207                    RETURN
```

```
                                        .SBTTL  TRAP    KERNEL TRAP HANDLER
                                ;*******************************************************************************
                                ;KERNEL IS A TRAP THAT COMES HERE
                                ;*******************************************************************************
                                $KERNEL:        BIC     #140000,2(SP)
                                        RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    ENERGIZE TRAP HANDLER
                                $ENERGIZE:BIS   #BIT9 BIT0,MMR0
                                        RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    DEENERGIZE TRAP HANDLER
                                $DEENERGIZE:BIC #BIT9.BIT0,MMR0
                                        RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    CACHON TRAP HANDLER
                                $CACHN: MOV     CACHK,CONTRL    ;SETUP CACHE AS PER CONSTANT (USUALLY 1 = FULLY ON)
                                        BIS     #BIT0,CONTRL    ;DISABLE TRAPS (BUT NOT ABORTS)
                                        RTI
                                ;*******************************************************************************
                                        .SBTTL  TRAP    CACHOFF TRAP HANDLER
                                        ;DISABLE TRAPS (NOT ABORTS), FORCE MISSES, FLUSH, BYPASS
                                $CACHF: BIS     #BIT0 BIT2.BIT3!BIT8.BIT9,CONTRL
                                        RTI
```

```
                                        .SBTTL  TRAP    LOAD CSR TRAP HANDLER
                                        ;LOAD CORRECT CSR WITH DATA IN CSR & CSR+2
037076                          $LOADC: PUSH    R0
037076  010046                                                                  MOV R0,-(SP)
037100  012700  172100                  MOV     #MK11ADD,R0             ;CREATE CSR ADDRESS
037104  063700  002256                  ADD     CSRNO,R0
037110  005737  002254                  TST     CSRREL                  ;CSR'S RELOCATED?
037114  001014                          BNE     $LOAD1                  ;YES - SKIP
037116  013720  002144                  MOV     CSR,(R0)+               ;LOAD IT
037122                                  IF TWOCSRS IS TRUE
037122  005737  002600                                                          TST TWOCSRS
037126  001403                                                                  BEQ L417
037130  013710  002146                    MOV   CSR+2,(R0)
037134                                  ELSE
037134  000402                                                                  BR L420
037136                                                                  L417:::::::
037136  042710  100000                    BIC   #BIT15,(R0)
037142                                  END ;OF IF TWOCSRS
037142                                                                  L420:::::::
037142                                  POP     R0
037142  012600                                                                  MOV (SP)+,R0
037144  000002                          RTI
037146  042700  020000          $LOAD1: BIC     #20000,R0
037152  013737  177746  002370          MOV     CNTRL,OLDCACHE          ;SAVE CACHE STATUS
037160  104424                          CACHOFF                 ;TURN CACHE OFF
037162  013720  002144                  MOV     CSR,(R0)+               ;LOAD IT
037166                                  IF TWOCSRS IS TRUE
037166  005737  002600                                                          TST TWOCSRS
037172  001403                                                                  BEQ L421
037174  013710  002146                    MOV   CSR+2,(R0)
037200                                  ELSE
037200  000402                                                                  BR L422
037202                                                                  L421:::::::
037202  042710  100000                    BIC   #BIT15,(R0)
037206                                  END ;OF IF TWOCSRS
037206                                                                  L422:::::::
037206  013737  002370  177746          MOV     OLDCACHE,CNTRL          ;RESTORE CACHE
037214                                  POP     R0
037214  012600                                                                  MOV (SP)+,R0
037216  000002                          RTI
```

```
 6302                                           .SBTTL  TRAP    READ CSR TRAP HANDLER
 6303                                           ;READ THE CORRECT CSR INTO LOCATIONS CSR & CSR+2
 6304 037220                            $READC: PUSH    R0
      037220 010046                                                                   MOV R0,-(SP)
 6305 037222 012700 172100                      MOV     #MK11ADD,R0             ;CREATE CSR ADDRESS
 6306 037226 063700 002256                      ADD     CSRNO,R0
 6307 037232 005737 002254                      TST     CSRREL                  ;CSR'S RELOCATED?
 6308 037236 001005                             BNE     1$                      ;YES - SKIP
 6309 037240 012037 002144                      MOV     (R0)+,CSR               ;READ IT
 6310 037244 011037 002146                      MOV     (R0),CSR+2              ;READ IT
 6311 037250 000415                             BR      2$
 6312 037252 042700 020000              1$:     BIC     #20000,R0
 6313 037256 013737 177746 002370               MOV     CONTRL,OLDCACHE         ;SAVE CACHE STATUS
 6314 037264 104424                             CACHOFF                 ;TURN CACHE OFF
 6315 037266 012037 002144                      MOV     (R0)+,CSR               ;READ IT
 6316 037272 011037 002146                      MOV     (R0),CSR+2              ;READ IT
 6317 037276 013737 002370 177746               MOV     OLDCACHE,CONTRL         ;RESTORE CACHE
 6318 037304                            2$:     POP     R0
      037304 012600                                                                   MOV (SP)+,R0
 6319 037306 000002                             RTI
 6320
 6321                                           .SBTTL  TRAP    TEST (R1) & READ CSR CAREFULLY
 6322 037310                            $TSTRD: PUSH    R0
      037310 010046                                                                   MOV R0,-(SP)
 6323 037312                                    BMOV    TSTRD1
      037312 004537 043710                          JSR R5,BLOCK1
      037316 037434                                 TSTRD1
                                                    .DSABL      CRF
 6324 037320 012700 172100                      MOV     #MK11ADD,R0             ;CREATE CSR ADDRESS
 6325 037324 063700 002256                      ADD     CSRNO,R0
 6326 037330 005737 002254                      TST     CSRREL                  ;CSR'S RELOCATED?
 6327 037334 001003                             BNE     1$                      ;YES - SKIP
 6328 037336 004737 177640                      CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
 6329 037342 000413                             BR      2$
 6330 037344 042700 020000              1$:     BIC     #20000,R0
 6331 037350 013737 177746 002370               MOV     CONTRL,OLDCACHE         ;SAVE CACHE STATUS
 6332 037356 104424                             CACHOFF                 ;TURN CACHE OFF
 6333 037360 004737 177640                      CALL    FASTCITY                ;CALL TO THE USER INSTRUCTION PAR'S
 6334 037364 013737 002370 177746               MOV     OLDCACHE,CONTRL         ;RESTORE CACHE
 6335                                           ;IF SINGLE BIT ERROR ONLY - SET CARRY BIT
 6336 037372                            2$:     POP     R0
      037372 012600                                                                   MOV (SP)+,R0
 6337 037374                                    IF #BIT4 SET.IN CSR AND #BIT15 OFF.IN CSR
      037374 032737 000020 002144                                                     BIT #BIT4,CSR
      037402 001410                                                                   BEQ L423
      037404 032737 100000 002144                                                     BIT #BIT15,CSR
      037412 001004                                                                   BNE L423
 6338 037414 052766 000001 000002                 BIS   #BIT0,2(SP)
 6339 037422                                    ELSE
      037422 000403                                                                   BR L424
      037424                                                                L423::::::
 6340 037424 042766 000001 000002                 BIC   #BIT0,2(SP)
 6341 037432                                    END ;OF IF #BIT4
      037432                                                                L424::::::
 6342 037432 000002                             RTI
 6343
 6344 037434 005010                     TSTRD1: CLR     (R0)                    ;v177640
```

```
 6345 037436                                SUPERVISOR                  ;V177642 ;ENTER SUPERVISOR MODE
      037436  052737  040000  177776        BIS     #BIT14,PSW          ;DO IT TO IT.
                                            .DSABL  CRF
 6346 037444  105711                        TSTB    (R1)                ;V177646
 6347 037446  042737  140000  177776        BIC     #BIT15!BIT14,PSW    ;V177650
 6348 037454  012037  002144                MOV     (R0)+,CSR           ;V177656
 6349 037460  011037  002146                MOV     (R0),CSR+2          ;V177662
 6350 037464  000207                        RETURN                      ;V177666
```

```
 6354                                           .SBTTL  TRAP    ECC DISABLE ALL CSR'S TRAP HANDLER
 6355 037466  012737  000002  002144  $ECCDIS:MOV     #BIT1,CSR
 6356 037474                                    IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
      037474  005737  002122                                                          TST KPFLAG
      037500  001403                                                                  BEQ L425
      037502  052737  000010  002144                                                  BIS #BIT3,CSR
      037510                                                                L425:::::::
 6357 037510  005037  002146                    CLR     CSR+2
 6358 037514  004737  040442                    CALL    CSROUT
 6359 037520  000002                            RTI
 6360                                           .SBTTL  TRAP    ECC DISABLE OF 1 SELECTED CSR TRAP HANDLER
 6361 037522  012737  000002  002144  $ECC1DIS:MOV     #BIT1,CSR
 6362 037530                                    IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
      037530  005737  002122                                                          TST KPFLAG
      037534  001403                                                                  BEQ L426
      037536  052737  000010  002144                                                  BIS #BIT3,CSR
      037544                                                                L426:::::::
 6363 037544  005037  002146                    CLR     CSR+2
 6364 037550  104425                            LOADCSR
 6365 037552  000002                            RTI
 6366                                           .SBTTL  TRAP    MK11 INITIALIZE ALL CSR'S TRAP HANDLER
 6367 037554  012737  000001  002144  $ECCINIT:MOV     #BIT0,CSR
 6368 037562  005037  002146                    CLR     CSR+2
 6369 037566  004737  040442                    CALL    CSROUT
 6370 037572  000002                            RTI
 6371                                           .SBTTL  TRAP    MK11 INITIALIZE 1 SELECTED CSR TRAP HANDLER
 6372 037574  012737  0000C1  002144  $ECC1INIT:MOV    #BIT0,CSR
 6373 037602  005037  002146                    CLR     CSR+2
 6374 037606  104425                            LOADCSR
 6375 037610  000002                            RTI
 6376                                           .SBTTL  TRAP    ENABLE SBE PARITY TRAPS ON ALL CSR'S
 6377 037612  012737  000003  002144  $ENASBE :MOV     #BIT0!BIT1,CSR
 6378 037620                                    IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
      037620  005737  002122                                                          TST KPFLAG
      037624  001403                                                                  BEQ L427
      037626  052737  000010  002144                                                  BIS #BIT3,CSR
      037634                                                                L427:::::::
 6379 037634  005037  002146                    CLR     CSR+2
 6380 037640  004737  040442                    CALL    CSROUT
 6381 037644  000002                            RTI
 6382                                           .SBTTL  TRAP    ENABLE SBE PARITY TRAPS ON 1 SELECTED CSR
 6383 037646  012737  000003  002144  $ENA1SBE:MOV     #BIT0!BIT1,CSR
 6384 037654                                    IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
      037654  005737  002122                                                          TST KPFLAG
      037660  001403                                                                  BEQ L430
      037662  052737  000010  002144                                                  BIS #BIT3,CSR
      037670                                                                L430:::::::
 6385 037670  005037  002146                    CLR     CSR+2
 6386 037674  104425                            LOADCSR
 6387 037676  000002                            RTI
 6388                                           .SBTTL  TRAP    WRITE CHECKBITS THRU ALL CSR'S TRAP HANDLER
 6389 037700  013737  002404  002144  $CBCSR: MOV     CHECK,CSR               ;BITS 14-8
 6390 037706  052737  000006  002144            BIS     #BIT1!BIT2,CSR          ;CHECK MODE
 6391 037714                                    IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
      037714  005737  002122                                                          TST KPFLAG
      037720  001403                                                                  BEQ L431
      037722  052737  000010  002144                                                  BIS #BIT3,CSR
```

```
                037730                                                                          L431:;;;;;;
 6392 037730  005037  002146                    CLR     CSR+2
 6393 037734  004737  040442                    CALL CSROUT
 6394 037740  000002                            RTI
 6395                                           .SBTTL  TRAP    WRITE CHECKBITS THRU 1 SELECTED CSR TRAP HANDLER
 6396 037742  013737  002404  002144  $CB1CSR:MOV     CHECK,CSR                ;BITS 14-8
 6397 037750  052737  000006  002144            BIS     #BIT1!BIT2,CSR           ;CHECK MODE
 6398 037756                                    IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
                037756  005737  002122                                                          TST KPFLAG
                037762  001403                                                                  BEQ L432
                037764  052737  000010  002144                                                BIS #BIT3,CSR
                037772                                                                          L432:;;;;;;
 6399 037772  005037  002146                    CLR     CSR+2
 6400 037776  104425                            LOADCSR
 6401 040000  000002                            RTI
```

```
                                        .SBTTL  TRAP    WAS THERE A SBE ON ANY CSR TRAP HANDLER
040002                          $WASSBE:PUSH    R1,R4
040002 010146                                                                   MOV R1,-(SP)
040004 010446                                                                   MOV R4,-(SP)
040006 013701 002334                    MOV     MKCSRS,R1       ;GET CSR'S BYTE
040012 005004                           CLR     R4
040014                                  BEGIN LWSBE
040014                                                                  B51:;;;;;;
040014                                    FOR CSRNO := #0 TO #34 BY #4
040014 005037 002256                                                            CLR CSRNO
040020                                                                  B52:;;;;;;
040020 106301                               ASLB        R1
040022                                      ON.ERROR
040022 103010                                                                   BCC L433
040024 104426                                 READCSR
040026                                        IF #BIT4 SET.IN CSR
040026 032737 000020 002144                                                     BIT #BIT4,CSR
040034 001403                                                                   BEQ L434
040036                                          SET     R4
040036 012704 177777                                                            MOV  #-1,R4
040042                                          LEAVE LWSBE
040042 000411                                                                   BR E51
040044                                        END ;OF IF #BIT4
040044                                                                  L434:;;;;;;
040044                                      END ;OF ON.ERROR
040044                                                                  L433:;;;;;;
040044                                      IFB R1 EQ #0 THEN LEAVE LWSBE
040044 105701                                                                   TSTB R1
040046 001407                                                                   BEQ E51
040050                                    END ;OF FOR CSRNO
040050 062737 000004 002256                                                     ADD #4,CSRNO
040056 023727 002256 000034                                                     CMP CSRNO,#34
040064 003755                                                                   BLE B52
040066                                                                  E52:;;;;;;;
040066                                  END LWSBE
040066                                                                  E51:;;;;;;;
040066 006004                           ROR     R4              ;SET C BIT FOR ERROR
040070                                  POP     R4,R1
040070 012604                                                                   MOV (SP)+,R4
040072 012601                                                                   MOV (SP)+,R1
040074                                  ON.ERROR
040074 103004                                                                   BCC L435
040076 052766 000001 000002               BIS   #BIT0,2(SP)
040104                                  ELSE
040104 000403                                                                   BR L436
040106                                                                  L435:;;;;;
040106 042766 000001 000002               BIC   #BIT0,2(SP)
040114                                  END ;OF ON.ERROR
040114                                                                  L436:;;;;;;
040114 000002                           RTI
                                        .SBTTL  TRAP    WAS THERE A SBE IN 1 SELECTED CSR TRAP HANDLER
                                        ;ON RETURN IF CARRY IS SET THERE WAS A SBE
040116 104426                   $WAS1SBE:READCSR
040120 042766 000001 000002             BIC     #BIT0,2(SP)     ;CLR C BIT ON STACK
040126 032737 000020 002144             BIT     #BIT4,CSR
040134 001403                           BEQ     1$
040136 052766 000001 000002             BIS     #BIT0,2(SP)     ;SET C BIT ON STACK
```

```
6437 146144 000002                1$:     RTI
```

```
                                        .SBTTL  TRAP    WAS THERE A DBE ON ANY CSR TRAP HANDLER
040146                          $WASDBE:PUSH    R1,R4                                   MOV R1,-(SP)
040146  010146                                                                         MOV R4,-(SP)
040150  010446
040152  013701  002334                  MOV     MKCSRS,R1       ;GET CSR'S BYTE
040156  005004                          CLR     R4
040160                                  BEGIN LWDBE
040160                                                                          B53:::::::
040160                                    FOR CSRNO := #0 TO #34 BY #4
040160  005037  002256                                                               CLR CSRNO
040164                                                                          B54:::::::
040164  106301                            ASLB        R1
040166                                    ON.ERROR
040166  103010                                                                  BCC L437
040170  104426                              READCSR
040172                                      IF #BIT15 SET.IN CSR
040172  032737  100000  002144                                                   BIT #BIT15,CSR
040200  001403                                                                  BEQ L440
040202                                        SET     R4
040202  012704  177777                                                          MOV  #-1,R4
040206                                        LEAVE LWDBE
040206  000411                                                                  BR E53
040210                                      END ;OF IF #BIT15
040210                                                                          L440:::::::
040210                                    END ;OF ON.ERROR
040210                                                                          L437:::::::
040210                                    IFB R1 EQ #0 THEN LEAVE LWDBE
040210  105701                                                                  TSTB R1
040212  001407                                                                  BEQ E53
040214                                    END ;OF FOR CSRNO
040214  062737  000004  002256                                                  ADD #4,CSRNO
040222  023727  002256  000034                                                  CMP CSRNO,#34
040230  003755                                                                  BLE B54
040232                                                                          E54:::::::
040232                                  END LWDBE
040232                                                                          E53:::::::
040232  006004                          ROR     R4              ;SET C BIT FOR ERROR
040234                                  POP     R4,R1
040234  012604                                                                  MOV (SP)+,R4
040236  012601                                                                  MOV (SP)+,R1
040240                                  ON.ERROR
040240  103004                                                                  BCC L441
040242  052766  000001  000002           BIS   #BIT0,2(SP)
040250                                  ELSE
040250  000403                                                                  BR L442
040252                                                                          L441:::::::
040252  042766  000001  000002           BIC   #BIT0,2(SP)
040260                                  END ;OF ON.ERROR
040260                                                                          L442:::::::
040260  000002                          RTI
                                        .SBTTL  TRAP    WAS THERE A DBE ON 1 SELECTED CSR TRAP HANDLER
                                        ;ON RETURN IF CARRY IS SET THERE WAS A DBE
040262  104426                  $WAS1DBE:READCSR
040264  005737  002144                  TST     CSR             ;DBE?
040270  100010                          BPL     3$              ;NO - SKIP
040272  005737  002146                  TST     CSR+2           ;DBE IN OTHER WORD?
040276  100401                          BMI     2$              ;YES - SKIP
```

```
 6472 040300  104021                          ERROR   +21             ;NO - ONLY ONE FLAG POPPED UP
 6473 040302  052766  000001  000002  2$:     BIS     #BIT0,2(SP)     ;SET C BIT ON STACK
 6474 040310  000002                          RTI
 6475 040312  042766  000001  000002  3$:     BIC     #BIT0,2(SP)     ;CLR C BIT ON STACK
 6476 040320  000002                          RTI
```

```
6479                                            .SBTTL  TRAP    CLEAR ALL MK11 CSR'S TRAP HANDLER
6480 040322                             $CLRCSR:CLEAR   CSR,CSR+2
     040322  005037  002144                                                          CLR  CSR
     040326  005037  002146                                                          CLR  CSR+2
6481 040332  004737  040442                     CALL    CSROUT
6482 040336  000002                             RTI
6483                                            .SBTTL  TRAP    CLEAR 1 SELECTED MK11 CSR TRAP HANDLER
6484 040340                             $CLR1CSR:CLEAR  CSR,CSR+2
     040340  005037  002144                                                          CLR  CSR
     040344  005037  002146                                                          CLR  CSR+2
6485 040350  104425                             LOADCSR
6486 040352  000002                             RTI
6487                                            .SBTTL  TRAP    ECC DISABLE, CHECH MODE, & WRITE CHECKBITS IN ALL CSR'S TRAP HANDLER
6488                                            ;CHECKBITS ALREADY IN LOC ''CSR''
6489 040354  052737  000006  002144  $CHKDIS:BIS     #BIT1!BIT2,CSR          ;ECC DISABLE & DIAG CHECK MODE
6490 040362                                     IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
     040362  005737  002122                                                          TST KPFLAG
     040366  001403                                                                  BEQ L443
     040370  052737  000010  002144                                                  BIS #BIT3,CSR
     040376                                                                 L443:;;;;;;
6491 040376  005037  002146                     CLR     CSR+2
6492 040402  004737  040442                     CALL    CSROUT
6493 040406  000002                             RTI
6494                                            .SBTTL  TRAP    ECC DISABLE, CHECH MODE, & WRITE CHECKBITS IN 1 SELECTED CSR
6495                                            ;CHELKBITS ALREADY IN LOC ''CSR''
6496 040410  052737  000006  002144  $CHK1DIS:BIS    #BIT1!BIT2,CSR          ;ECC DISABLE & DIAG CHECK MODE
6497 040416                                     IF KPFLAG IS TRUE THEN LET CSR := CSR SET.BY #BIT3
     040416  005737  002122                                                          TST KPFLAG
     040422  001403                                                                  BEQ L444
     040424  052737  000010  002144                                                  BIS #BIT3,CSR
     040432                                                                 L444:;;;;;;
6498 040432  005037  002146                     CLR     CSR+2
6499 040436  104425                             LOADCSR
6500 040440  000002                             RTI
```

```
6503 040442                            CSROUT: SUBTST  <<SUBR  WRITE IN ALL CSR'S>>
                                       ;*****************************************************************
                                       ;*SUBTEST       SUBR    WRITE IN ALL CSR'S
                                       ;*****************************************************************
6504 040442                                    PUSH    R1
     040442  010146                                                              MOV R1,-(SP)
6505 040444  013701  002334                    MOV     MKCSRS,R1       ;GET CSR'S BYTE
6506 040450                                    BEGIN LCSROUT
     040450                                                            B55:::::::
6507 040450                                      FOR CSRNO :- #0 TO #34 BY #4
     040450  005037  002256                                                      CLR CSRNO
     040454                                                            B56:::::::
6508 040454  106301                              ASLB        R1
6509 040456                                      ON.ERROR
     040456  103001                                                            BCC L445
6510 040460  104425                                LOADCSR
6511 040462                                      END ;OF ON.ERROR
     040462                                                            L445:::::::
6512 040462                                      IFB R1 EQ #0 THEN LEAVE LCSROUT
     040462  105701                                                            TSTB R1
     040464  001407                                                            BEQ E55
6513 040466                                    END ;OF FOR CSRNO
     040466  062737  000004  002256                                            ADD #4,CSRNO
     040474  023727  002256  000034                                            CMP CSRNO,#34
     040502  003764                                                            BLE B56
     040504                                                            E56:::::::
6514 040504                                    END LCSROUT
     040504                                                            E55:::::::
6515 040504                                    POP     R1
     040504  012601                                                            MOV (SP)+,R1
6516 040506  000207                          RETURN
6517
6518                                           .SBTTL  TRAP    INVALIDATE BACKGROUND PATTERN
6519 040510                            $INVALID:PUSH   R0,R1
     040510  010046                                                            MOV R0,-(SP)
     040512  010146                                                            MOV R1,-(SP)
6520 040514  013701  002106                    MOV     BANK,R1
6521 040520  070127  000006                    MUL     #6,R1
6522 040524  042761  020000  003020           BIC     #BIT13,CONFIG+2(R1)
6523 040532                                    POP     R1,R0
     040532  012601                                                            MOV (SP)+,R1
     040534  012600                                                            MOV (SP)+,R0
6524 040536  000002                          RTI
```

```
 6528 040540                            CHKGEN: SUBTST<<SUBR    GENERATE CHECK BITS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    GENERATE CHECK BITS
                                        ;*****************************************************************************
 6529                                           ;CHECK BIT GENERATOR ROUTINE
 6530                                           ;CALLING SEQUENCE IS:
 6531                                           ;       MOV     #WORD1,SOURCE   ;SOURCE = ADDRESS OF DATA
 6532                                           ;       CALL    CHKGEN
 6533                                           ;
 6534                                           ;CHECK BITS RETURNED IN BITS 14-8 OF LOCATION CHECK
 6535                                           ;
 6536 040540                                    PUSH    R0,R1,R2,R3,R4,R5
      040540  010046                                                          MOV R0,-(SP)
      040542  010146                                                          MOV R1,-(SP)
      040544  010246                                                          MOV R2,-(SP)
      040546  010346                                                          MOV R3,-(SP)
      040550  010446                                                          MOV R4,-(SP)
      040552  010546                                                          MOV R5,-(SP)
 6537 040554  012702  000077                    MOV     #77,R2          ;DEFAULT CHECKBITS FOR DOUBLE WORD OF ZEROS
 6538 040560  012703  040640                    MOV     #CHKTAB,R3      ;ADDRESS OF CHECKBIT TABLE
 6539 040564  013705  002402                    MOV     SOURCE,R5       ;GET SOURCE ADDRESS
 6540 040570  012501                            MOV     (R5)+,R1        ;GET LSB'S
 6541 040572  011500                            MOV     (R5),R0         ;GET MSB'S
 6542
 6543 040574  006704                    1$:     SXT     R4              ;EXTEND SIGN OF DOUBLE WORD TO R4
 6544 040576  142304                            BICB    (R3)+,R4        ;ELIMINATE BITS THAT DON'T COUNT
 6545 040600  074402                            XOR     R4,R2           ;COMPLEMENT MASKED BITS IN CHECKBITS
 6546 040602  073027  000001                    ASHC    #1,R0           ;DOUBLE PRECISION LEFT SHIFT R0,,R1
 6547 040606  001372                            BNE     1$              ;LOOP TILL ALL BITS ARE CHECKED
 6548
 6549 040610  042702  177600                    BIC     #^C177,R2               ;KILL ALL JUNK BITS
 6550 040614  000302                            SWAB    R2              ;POSITION CHECKBITS IN BITS 14-8
 6551 040616  010237  002404                    MOV     R2,CHECK
 6552 040622                                    POP     R5,R4,R3,R2,R1,R0
      040622  012605                                                                    MOV (SP)+,R5
      040624  012604                                                                    MOV (SP)+,R4
      040626  012603                                                                    MOV (SP)+,R3
      040630  012602                                                                    MOV (SP)+,R2
      040632  012601                                                                    MOV (SP)+,R1
      040634  012600                                                                    MOV (SP)+,R0
 6553 040636  000207                            RETURN
```

```
 6556 040640                        CHKTAB: ;BYTE #3
 6557 040640  200                           .BYTE   ^C177           ;BIT 31
 6558 040641  301                           .BYTE   ^C076           ;BIT 30
 6559 040642  302                           .BYTE   ^C075           ;BIT 29
 6560 040643  203                           .BYTE   ^C174           ;BIT 28
 6561 040644  304                           .BYTE   ^C073           ;BIT 27
 6562 040645  205                           .BYTE   ^C172           ;BIT 26
 6563 040646  206                           .BYTE   ^C171           ;BIT 25
 6564 040647  307                           .BYTE   ^C070           ;BIT 24
 6565                                       ;BYTE #2
 6566 040650  310                           .BYTE   ^C067           ;BIT 23
 6567 040651  211                           .BYTE   ^C166           ;BIT 22
 6568 040652  212                           .BYTE   ^C165           ;BIT 21
 6569 040653  313                           .BYTE   ^C064           ;BIT 20
 6570 040654  214                           .BYTE   ^C163           ;BIT 19
 6571 040655  315                           .BYTE   ^C062           ;BIT 18
 6572 040656  316                           .BYTE   ^C061           ;BIT 17
 6573 040657  217                           .BYTE   ^C160           ;BIT 16
 6574                                       ;BYTE #1
 6575 040660  320                           .BYTE   ^C057           ;BIT 15
 6576 040661  221                           .BYTE   ^C156           ;BIT 14
 6577 040662  222                           .BYTE   ^C155           ;BIT 13
 6578 040663  323                           .BYTE   ^C054           ;BIT 12
 6579 040664  224                           .BYTE   ^C153           ;BIT 11
 6580 040665  325                           .BYTE   ^C052           ;BIT 10
 6581 040666  326                           .BYTE   ^C051           ;BIT  9
 6582 040667  227                           .BYTE   ^C150           ;BIT  8
 6583                                       ;BYTE #0
 6584 040670  340                           .BYTE   ^C037           ;BIT  7
 6585 040671  241                           .BYTE   ^C136           ;BIT  6
 6586 040672  242                           .BYTE   ^C135           ;BIT  5
 6587 040673  343                           .BYTE   ^C034           ;BIT  4
 6588 040674  244                           .BYTE   ^C133           ;BIT  3
 6589 040675  345                           .BYTE   ^C032           ;BIT  2
 6590 040676  346                           .BYTE   ^C031           ;BIT  1
 6591 040677  247                           .BYTE   ^C130           ;BIT  0
```

```
                                        SUBTST<<SUBR    MAPPER>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    MAPPER
                                ;*****************************************************************************
                                ;
                                ;THIS SUBROUTINE MAPS THE MEMORY BANK (16K WORDS = 1 BANK)
                                ;IN R3 TO THE TEST PATTERN AREA (SUPERVISOR VIRTUAL (60000 - 157777).
                                ;
                                ;CALL    MOV     BANKNO,R3               ;SET UP BANK ARGUEMENT
                                ;        CALL    MAPPER                  ;ACTUAL CALL
                                ;        RETURN                          ;ONLY RETURN

                                        ;SET SUPERVISOR UP FOR 1 TO 1 MAP
040700                          MAPPER: PUSH    R0,R1,R2,R4,R5
040700  010046                                                          MOV R0,-(SP)
040702  010146                                                          MOV R1,-(SP)
040704  010246                                                          MOV R2,-(SP)
040706  010446                                                          MOV R4,-(SP)
040710  010546                                                          MOV R5,-(SP)
040712  012700  172340                  MOV     #KIPAR0,R0              ;FIRST AREA TO MAP TO
040716  012701  172240                  MOV     #SIPAR0,R1              ;FIRST ADDRESS REGISTER
040722  012702  077406                  MOV     #77406,R2               ;CONSTANT FOR 4K PAGE, UP, R/W
040726  012704  172200                  MOV     #SIPDR0,R4              ;FIRST DISCRIPTOR REGISTER
040732  012705  000010                  MOV     #8.,R5                  ;COUNTER
040736  012021                  1$:     MOV     (R0)+,(R1)+             ;PUT IN SUPERVISOR ADDRESS
040740  010224                          MOV     R2,(R4)+                ;PUT IN SUPERVISOR DISCRIPTOR
040742  077503                          SOB     R5,1$                   ;LOOP TILL DONE
040744  012741  177600                  MOV     #177600,-(R1)           ;CORRECT LAST FIELD FOR PERIPHERALS PAGE

                                        ;SET UP SUPERVISOR FOR TEST AREA
040750  022703  000170                  CMP     #120.,R3                ;MAP NOTHING (1 TO 1)?
040754  001412                          BEQ     3$                      ;YES - SKIP
040756  072327  000011                  ASH     #9.,R3                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
                                                                        ;FOR MEMORY MANAGEMENT = 1000
040762  012701  172246                  MOV     #SIPAR3,R1              ;SETUP FOR AUTO INCREMENTING
040766  012702  000004                  MOV     #4,R2                   ;COUNTER
040772  010321                  2$:     MOV     R3,(R1)+                ;PLUG IN PAR INFO
040774  062703  000200                  ADD     #200,R3                 ;BUMP ADDRESS 4K
041000  077204                          SOB     R2,2$                   ;LOOP TILL DONE
041002                          3$:     POP     R5,R4,R2,R1,R0
041002  012605                                                          MOV (SP)+,R5
041004  012604                                                          MOV (SP)+,R4
041006  012602                                                          MOV (SP)+,R2
041010  012601                                                          MOV (SP)+,R1
041012  012600                                                          MOV (SP)+,R0
041014  000207                          RETURN
                                        .SBTTL  TRAP    MAP KERNEL (ALMOST 1 TO 1) TRAP HANDLER
041016                          $KMAP:  PUSH    R0,R1,R2,R3,R4
041016  010046                                                          MOV R0,-(SP)
041020  010146                                                          MOV R1,-(SP)
041022  010246                                                          MOV R2,-(SP)
041024  010346                                                          MOV R3,-(SP)
041026  010446                                                          MOV R4,-(SP)
041030  005000                          CLR     R0                      ;1ST AREA TO MAP TO
041032  012701  172340                  MOV     #KIPAR0,R1              ;FIRST ADDRESS
041036  012702  077406                  MOV     #77406,R2               ;CONSTANT FOR 4K PAGE,UP,R/W
041042  012703  172300                  MOV     #KIPDR0,R3              ;1ST PAGE DISCRIPTOR REGISTER
041046  012704  000010                  MOV     #8.,R4                  ;COUNTER
```

```
 6634 041052  010021                    1$:     MOV     R0,(R1)+                ;PUT IN KERNEL ADDRESS
 6635 041054  010223                            MOV     R2,(R3)+                ;PUT IN KERNEL DISCRIPTOR
 6636 041056  062700  000200                    ADD     #200,R0                 ;ADD ADDRESS CONSTANT FOR 4K CHANGE
 6637 041062  077405                            SOB     R4,1$                   ;LOOP TILL DONE
 6638 041064  012741  177600                    MOV     #177600,-(R1)           ;THE PERIPHERALS PAGE TO KIPAR7
 6639 041070  012741  177400                    MOV     #177400,-(R1)           ;AND NEXT LOWER PAGE TO KIPAR6
 6640 041074                                    IF CPUBIT NE #MASTER            ;IF I'M NOT THE MASTER
      041074  023727  002114  000020                                                    CMP CPUBIT,#MASTER
      041102  001404                                                                   BEQ L446
 6641 041104  013700  002710                      MOV   LOADHOME,R0             ;MAP TO LOADERS LIKE THE MASTER DID:
 6642 041110  004737  042370                      CALL  NEWLOAD
 6643 041114                                    END ;OF IF CPUBIT
      041114                                                                    L446:;;;;;;
 6644 041114                                    POP     R4,R3,R2,R1,R0
      041114  012604                                                                   MOV (SP)+,R4
      041116  012603                                                                   MOV (SP)+,R3
      041120  012602                                                                   MOV (SP)+,R2
      041122  012601                                                                   MOV (SP)+,R1
      041124  012600                                                                   MOV (SP)+,R0
 6645 041126  000002                            RTI
```

```
 6649 041130                            RELOCATE:SUBTST <<RELOCATE PROGRAM>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       RELOCATE PROGRAM
                                        ;*****************************************************************************
 6650 041130                                    IF #SW12 SET.IN @SWR THEN $RETURN ERROR
      041130  032777  010000  141630                                                    BIT #SW12,@SWR
      041136  001402                                                                    BEQ L447
      041140  000261                                                                    SEC
      041142  000207                                                                    RTS PC
      041144                                                                  L447:::::::
 6651 041144                                BEGIN LOADERBANK
      041144                                                                  B57:::::::
 6652 041144                                  FOR BANK :- #1 TO #167
      041144  012737  000001  002106                                                    MOV #1,BANK
      041152                                                                  B60:::::::
 6653 041152  004737  042422                    CALL EXBANK
 6654 041156                                    IF ACFLAG IS TRUE AND PFLAG IS FALSE AND BMFLAG IS FALSE
      041156  005737  002124                                                          TST ACFLAG
      041162  001431                                                                  BEQ L450
      041164  005737  002130                                                          TST PFLAG
      041170  001026                                                                  BNE L450
      041172  005737  002136                                                          TST BMFLAG
      041176  001023                                                                  BNE L450
 6655 041200  013700  002106                      MOV       BANK,R0
 6656 041204  010037  002532                      MOV       R0,LOADBANK
 6657 041210  013701  002710                      MOV       LOADHOME,R1
 6658 041214  004737  042072                      CALL      BANKMOV
 6659 041220  004737  042370                      CALL      NEWLOAD         ;MAP NEW LOADER BANK IN KERNEL
 6660 041224  013701  002110                      MOV       BANKINDEX,R1
 6661 041230  052761  100000  003020              BIS       #BIT15,CONFIG+2(R1)     ;MARK LOADER
 6662 041236  042761  020000  003020              BIC       #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
 6663 041244                                    LEAVE LOADERBANK
      041244  000416                                                                  BR E57
 6664 041246                                    END ;OF IF ACFLAG
      041246                                                                  L450:::::::
 6665 041246                                  END ;OF FOR BANK
      041246  005237  002106                                                          INC BANK
      041252  023727  002106  000167                                                  CMP BANK,#167
      041260  003734                                                                  BLE B60
      041262                                                                  E60:::::::::
 6666 041262                                  IF #SW13 OFF.IN @SWR
      041262  032777  020000  141476                                                  BIT #SW13,@SWR
      041270  001002                                                                  BNE L451
 6667 041272                                    TYPE        MSG075          ;RELOCATION NOT POSSIBLE
      041272  104401  115341                 TYPEIT  ,MSG075
                                            .DSABL  CRF
 6668 041276                                  END ;OF IF #SW13
      041276                                                                  L451:::::::
 6669 041276                                  $RETURN ERROR
      041276  000261                                                                  SEC
      041300  000207                                                                  RTS PC
 6670 041302                                END LOADERBANK
      041302                                                                  E57:::::::
 6671 041302                                BEGIN FINDBANK
      041302                                                                  B61:::::::
 6672 041302                                  FOR R1 := #3*2 TO #167*3*2 BY #6
      041302  012701  000006                                                          MOV #3*2,R1
```

```
                041306                                                                  B62:::::::
6673            041306                          IF #BIT11!BIT15 OFF.IN CONFIG(R1) ;IF NO ERROPS & NOT PROGRAM SPACE
                041306  032761  104000  003016                                                  BIT #BIT11!BIT15,CONFIG(R1)
                041314  001035                                                                  BNE L452
6674            041316                            IF #BIT15 OFF.IN CONFIG+2(R1) ;IF NOT LOADER BANK
                041316  032761  100000  003020                                                  BIT #BIT15,CONFIG+2(R1)
                041324  001031                                                                  BNE L453
6675            041326                              IF CPUBIT SET.IN CONFIG(R1) ;IF ACCESSABLE
                041326  033761  002114  003016                                                  BIT CPUBIT,CONFIG(R1)
                041334  001425                                                                  BEQ L454
6676            041336                                IF #BIT13!BIT14 OFF.IN CONFIG(R1) THEN LEAVE FINDBANK ;IF MJ11
                041336  032761  060000  003016                                                  BIT #BIT13!BIT14,CONFIG(R1)
                041344  001436                                                                  BEQ E61
6677            041346                                IF #BIT13 SET.IN CONFIG(R1) AND #BIT14 OFF.IN CONFIG(R1) ;IF MK11
                041346  032761  020000  003016                                                  BIT #BIT13,CONFIG(R1)
                041354  001415                                                                  BEQ L455
                041356  032761  040000  003016                                                  BIT #BIT14,CONFIG(R1)
                041364  001011                                                                  BNE L455
6678            041366                                  IF #BIT12 SET.IN CONFIG-6(R1) AND #BIT12 OFF.IN CONFIG(R1)
                041366  032761  010000  003010                                                  BIT #BIT12,CONFIG-6(R1)
                041374  001405                                                                  BEQ L456
                041376  032761  010000  003016                                                  BIT #BIT12,CONFIG(R1)
                041404  001001                                                                  BNE L456
6679
6680            041406                                    ;IF 1ST UNPROTECTED MK11 BANK
                                                          LEAVE FINDBANK
                041406  000415                                                                  BR E61
6681            041410                                  END ;OF IF #BIT12
                041410                                                                  L456:::::::
6682            041410                                END ;OF IF #BIT13
                041410                                                                  L455:::::::
6683            041410                              END ;OF IF CPUBIT
                041410                                                                  L454:::::::
6684            041410                            END ;OF IF #BIT15
                041410                                                                  L453:::::..
6685            041410                          END ;OF IF #BIT11
                041410                                                                  L452:::::::
6686            041410                        END ;OF FOR
                041410  062701  000006                                                          ADD #6,R1
                041414  020127  001312                                                          CMP R1,#167*3*2
                041420  003732                                                                  BLE B62
                041422                                                                  E62:::::::::
6687            041422                          IF #SW13 OFF.IN @SWR
                041422  032777  020000  141336                                                  BIT #SW13,@SWR
                041430  001002                                                                  BNE L457
6688            041432                            TYPE        MSG075          ;RELOCATION NOT POSSIBLE
                041432  104401  115341                  TYPEIT  ,MSG075
                                                        .DSABL  CRF
6689            041436                          END ;OF IF #SW13
                041436                                                                  L457:::::::
6690            041436                          $RETURN ERROR
                041436  000261                                                                  SEC
                041440  000207                                                                  RTS PC
6691            041442                      END FINDBANK
                041442                                                                  E61:::::::
6692            041442  042761  020000  003020      BIC     #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
6693            041450  005000                      CLR     R0
6694            041452  071027  000006              DIV     #6,R0
```

```
6697 041456                        RELOC1: LET NEWBANK := R0                                    MOV R0,NEWBANK
     041456  010037  002400
6698 041462  004737  042240                CALL    USERMAP          ;MAP NEWBANK TO USER PAR
6699 041466                                USER                     ;ENTER USER MODE
     041466  052737  140000  177776        BIS     #BIT15.BIT14,PSW          ;DO IT TO IT!
                                           .DSABL  CRF
6700 041474                                BMOV    0,100000,SIZE    ;MOVE PROGRAM
     041474  004537  043744                    JSR R5,BLOCK3
     041500  040000                           SIZE
     041502  100000                           100000
     041504  000000                           0
                                               .DSABL      CRF
6701 041506  104417                          KERNEL                   ;ENTER KERNEL MODE
6702 041510  042737  000040  172516          BIC     #BIT5,MMR3       ;TURN OFF UNIBUS MAP
6703 041516  013700  002400                  MOV     NEWBANK,R0
6704 041522  006200                          ASR     R0
6705 041524                                 ON.ERROR
     041524  103003                                                                  BCC L460
6706 041526  012737  100000  170200            MOV   #BIT15,MAPLO
6707 041534                                 END ;OF ON.ERROR
     041534                                                                      L460:;;;;;;
6708 041534  010037  170202                  MOV     R0,MAPH0
6709 041540  004737  042026                  CALL    LOWMAP           ;SETUP LOWER 16K IN UNIBUS MAP
6710 041544  052737  000040  172516          BIS     #BIT5,MMR3       ;ENERGIZE UNIBUS MAP
6711 041552  042737  001001  177572          BIC     #BIT9!BIT0,MMR0  ;DEENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6712 041560  004737  042322                  CALL    NEWKERNEL
6713 041564  052737  001001  177572          BIS     #BIT9!BIT0,MMR0  ;ENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6714 041572                                 SET     RLFLAG
     041572  012737  177777  002134                                                      MOV  #-1,RLFLAG
6715 041600                                 $RETURN NOERROR
     041600  000241                                                                     CLC
     041602  000207                                                                     RTS PC
```

```
6718 041604                            UNRELOCATE:SUBTST       <<UNRELOCATE PROGRAM>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       UNRELOCATE PROGRAM
                                       ;*****************************************************************************
6719
6720 041604                                    ;RESTORE LOADERS
                                               PUSH    R0
     041604  010046                                                                    MOV R0,-(SP)
6721 041606  013701  002532                      MOV     LOADBANK,R1
6722 041612  013700  002710                      MOV     LOADHOME,R0
6723 041616  004737  042072                      CALL    BANKMOV
6724 041622  004737  042370                      CALL    NEWLOAD                ;MAP NEW LOADER BANK IN KERNEL SPACE
6725 041626                                      PUSH    BANK
     041626  013746  002106                                                        MOV BANK,-(SP)
6726 041632  013737  002532  002106              MOV     LOADBANK,BANK
6727 041640  004737  042422                      CALL    EXBANK
6728 041644  013701  002110                      MOV     BANKINDEX,R1
6729 041650  042761  100000  003020              BIC     #BIT15,CONFIG+2(R1)    ;CLEAR LOADER FLAG
6730 041656  013737  002710  002106              MOV     LOADHOME,BANK
6731 041664  004737  042422                      CALL    EXBANK
6732 041670  013701  002110                      MOV     BANKINDEX,R1
6733 041674  042761  020000  003020              BIC     #BIT13,CONFIG+2(R1)    ;INVALIDATE BACKGROUND PATTERN
6734 041702                                      POP     BANK
     041702  012637  002106                                                        MOV (SP)+,BANK
6735
6736                                           ;RESTORE BANK 0
6737 041706  042737  020000  003020              BIC     #BIT13,CONFIG+2        ;INVALIDATE BACKGROUND PATTERN
6738 041714                                      LET NEWBANK := #0
     041714  005037  002400                                                        CLR NEWBANK
6739 041720  004737  042240                      CALL    USERMAP                ;MAP NEWBANK TO USER PAR
6740 041724                                      USER                           ;ENTER USER MODE
     041724  052737  140000  177776              BIS     #BIT15!BIT14,PSW               ;DO IT TO IT!
                                                 .DSABL  CRF
6741 041732                                      BMOV    0,100000,SIZE          ;MOVE PROGRAM
     041732  004537  043744                          JSR R5,BLOCK3
     041736  040000                                 SIZE
     041740  100000                                 100000
     041742  000000                                 0
                                                     .DSABL      CRF
6742 041744  104417                              KERNEL                         ;ENTER KERNEL MODE
6743 041746  042737  001001  177572              BIC     #BIT9!BIT0,MMR0        ;DEENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6744 041754  004737  042322                      CALL    NEWKERNEL
6745 041760  052737  001001  177572              BIS     #BIT9!BIT0,MMR0        ;ENERGIZE MEMORY MANAGEMENT - BUT DON'T TRAP
6746 041766  005037  002134                      CLR     RLFLAG
6747 041772  042737  000040  172516              BIC     #BIT5,MMR3             ;TURN OFF UNIBUS MAP
6748 042000                                      CLEAR   MAPL0,MAPH0
     042000  005037  170200                                                        CLR  MAPL0
     042004  005037  170202                                                        CLR  MAPH0
6749 042010  004737  042026                      CALL    LOWMAP                 ;SETUP LOWER 16K OF UNIBUS MAP
6750 042014  052737  000040  172516              BIS     #BIT5,MMR3             ;ENERGIZE UNIBUS MAP
6751 042022                                      POP     R0
     042022  012600                                                              MOV (SP)+,R0
6752 042024  000207                              RETURN
6753
6754 042026                            LOWMAP: SUBTST  <<SETUP LOWER 16K OF UNIBUS MAP>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       SETUP LOWER 16K OF UNIBUS MAP
                                       ;*****************************************************************************
```

```
 6755 042026                                    PUSH    R0,R1,R2
      042026  010046                                                    MOV R0,-(SP)
      042030  010146                                                    MOV R1,-(SP)
      042032  010246                                                    MOV R2,-(SP)
 6756 042034  012700  170200                    MOV     #MAPL0,R0
 6757 042040  012701  170204                    MOV     #MAPL1,R1
 6758 042044  012702  000003                    MOV     #3,R2
 6759 042050  012011                    1$:     MOV     (R0)+,(R1)
 6760 042052  062721  020000                    ADD     #BIT13,(R1)+
 6761 042056  012021                            MOV     (R0)+,(R1)+
 6762 042060  077205                            SOB     R2,1$
 6763 042062                                    POP     R2,R1,R0
      042062  012602                                                    MOV (SP)+,R2
      042064  012601                                                    MOV (SP)+,R1
      042066  012600                                                    MOV (SP)+,R0
 6764 042070  000207                            RETURN
```

```
 6767 042072                            BANKMOV:SUBTST  <<MOVE BANKS>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        MOVE BANKS
                                        ;*****************************************************************************
 6768                                           ;MOVE 3/4 OF A BANK
 6769                                           ;CALLING SEQUENCE
 6770                                           ;R0 = DESTINATION BANK
 6771                                           ;R1 = SOURCE BANK
 6772 042072  104415                           SAVREG
 6773 042074  004737  042240                   CALL    USERMAP
 6774 042100  104416                           RESREG
 6775 042102  104415                           SAVREG
 6776 042104  072027  000011                   ASH     #9.,R0
 6777 042110  072127  000011                   ASH     #9.,R1
 6778 042114  012702  177650                   MOV     #UIPAR4,R2
 6779 042120  012703  000200                   MOV     #200,R3
 6780
 6781 042124  010122                           MOV     R1,(R2)+                ;MAP 1ST HALF BANK
 6782 042126  060301                           ADD     R3,R1                   ;BUMP BY 4K
 6783 042130  010122                           MOV     R1,(R2)+
 6784 042132  060301                           ADD     R3,R1
 6785
 6786 042134  010022                           MOV     R0,(R2)+
 6787 042136  060300                           ADD     R3,R0
 6788 042140  010022                           MOV     R0,(R2)+
 6789 042142  060300                           ADD     R3,R0
 6790
 6791 042144                                   USER
      042144  052737  140000  177776          BIS     #BIT15!BIT14,PSW                ;DO IT TO IT.
                                              .DSABL  CRF
 6792 042152                                   BMOV    100000,140000,SIZE/2    ;MOV 1ST HALF BANK
      042152  004537  043744                       JSR R5,BLOCK3
      042156  020000                             SIZE/2
      042160  140000                             140000
      042162  100000                             100000
                                                 .DSABL      CRF
 6793 042164  104417                           KERNEL                  ;ENTER KERNEL MODE
 6794
 6795 042166  012702  177650                   MOV     #UIPAR4,R2
 6796
 6797 042172  010122                           MOV     R1,(R2)+                ;MAP 2ND HALF BANK
 6798 042174  060301                           ADD     R3,R1                   ;BUMP BY 4K
 6799 042176  010122                           MOV     R1,(R2)+
 6800 042200  060301                           ADD     R3,R1
 6801
 6802 042202  010022                           MOV     R0,(R2)+
 6803 042204  060300                           ADD     R3,R0
 6804 042206  010022                           MOV     R0,(R2)+
 6805 042210  060300                           ADD     R3,R0
 6806
 6807 042212                                   USER
      042212  052737  140000  177776          BIS     #BIT15.BIT14,PSW                ;DO IT TO IT.
                                              .DSABL  CRF
 6808 042220                                   BMOV    100000,140000,SIZE/4    ;MOV 3ND FOURTH OF BANK
      042220  004537  043744                       JSR R5,BLOCK3
      042224  010000                             SIZE/4
      042226  140000                             140000
```

```
        042230  100000                          100000
                                                .DSABL      CRF
  6809  042232  104417                  KERNEL                      ;ENTER KERNEL MODE
  6810
  6811  042234  104416                  RESREG
  6812  042236  000207                  RETURN
```

```
                                        USERMAP:SUBTST  <<SUBR  MAP USER TO NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    MAP USER TO NEW BANK
                                        ;*****************************************************************************
6816 042240  012701  177640                     MOV     #UIPAR0,R1              ;COPY KERNEL PAR'S & PDR'S (0-3)
6817 042244  012702  172340                     MOV     #KIPAR0,R2
6818 042250  012703  177600                     MOV     #UIPDR0,R3
6819 042254  012704  172300                     MOV     #KIPDR0,R4
6820 042260  012705  000004                     MOV     #4,R5
6821 042264  012221                     1$:    MOV     (R2)+,(R1)+
6822 042266  011423                            MOV     (R4),(R3)+
6823 042270  077503                            SOB     R5,1$
6824
6825 042272  013700  002400                     MOV     NEWBANK,R0
6826 042276  072027  000011                     ASH     #9.,R0                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
6827                                                                            ;FOR MEMORY MANAGEMENT = 1000
6828 042302  012705  000004                     MOV     #4,R5
6829 042306  010021                     2$:    MOV     R0,(R1)+                ;SETUP UIPAR(4-7)
6830 042310  062700  000200                     ADD     #200,R0                 ;BUMP ADDRESS 4K
6831 042314  011423                            MOV     (R4),(R3)+              ;SETUP UIPDR(4-7)
6832 042316  077505                            SOB     R5,2$
6833 042320  000207                            RETURN
6834
6835 042322                             NEWKERNEL:SUBTST        <<SUBR  SETUP KERNEL PAR'S FOR NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    SETUP KERNEL PAR'S FOR NEW BANK
                                        ;*****************************************************************************
6836 042322                                     PUSH    R0,R1,R5
     042322  010046                                                             MOV R0,-(SP)
     042324  010146                                                             MOV R1,-(SP)
     042326  010546                                                             MOV R5,-(SP)
6837 042330  012700  172340                     MOV     #KIPAR0,R0
6838 042334  013701  002400                     MOV     NEWBANK,R1
6839 042340  072127  000011                     ASH     #9.,R1                  ;BANK 1 STARTS AT 100,000 LESS 6 LSB'S
6840                                                                            ;FOR MEMORY MANAGEMENT = 1000
6841 042344  012705  000004                     MOV     #4,R5
6842 042350  010120                     1$:    MOV     R1,(R0)+                ;SETUP KIPAR(0-3)
6843 042352  062701  000200                     ADD     #200,R1
6844 042356  077504                            SOB     R5,1$
6845 042360                                     POP     R5,R1,R0
     042360  012605                                                             MOV (SP)+,R5
     042362  012601                                                             MOV (SP)+,R1
     042364  012600                                                             MOV (SP)+,R0
6846 042366  000207                            RETURN
6847
6848 042370                             NEWLOAD:SUBTST  <<SUBR  SETUP KERNEL PAR'S FOR NEW LOADER BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    SETUP KERNEL PAR'S FOR NEW LOADER BANK
                                        ;*****************************************************************************
6849                                            ;R0 CONTAINS THE DESTINATION BANK
6850 042370                                     PUSH    R0,R1
     042370  010046                                                             MOV R0,-(SP)
     042372  010146                                                             MOV R1,-(SP)
6851 042374  012701  172350                     MOV     #KIPAR4,R1
6852 042400  072027  000011                     ASH     #9.,R0                  ;BANK 1 STARTS AT 1000000 LESS 6 LSB'S (1000)
6853 042404  010021                     2$:    MOV     R0,(R1)+                ;SETUP KIPAR4
6854 042406  062700  000200                     ADD     #200,R0
```

```
6855 042412  010021          MOV     R0,(R1)+            ;SETUP KIPAR5
6856 042414                  POP     R1,R0
     042414  012601                                                  MOV (SP)+,R1
     042416  012600                                                  MOV (SP)+,R0
6857 042420  000207          RETURN
```

```
 6861 042422                            EXBANK: SUBTST  <<SUBR  EXAMINE BANK>>
                                        ;*************************************** ***************************************
                                        ;*SUBTEST        SUBR    EXAMINE BANK
                                        ;*****************************************************************************
 6862                                   ;DOES THE FOLLOWING:
 6863                                   ;(1) SETS UP "BANKINDEX" AND R0 BASED ON VALUE OF "BANK"
 6864                                   ;(2) SETS THE "MKFLAG" IF THE BANK IS AN MK11
 6865                                   ;(3) SETS THE "KPFLAG" IF THE BANK IS THE PROTECTED REGION OF MK11 MEMORY
 6866                                   ;(4) SETS THE "ACFLAG" IF THE BANK CAN BE ACCESSED BY THIS CPU
 6867                                   ;(5) SETS THE "PFLAG" IF THE BANK IS IN PROGRAM SPACE
 6868                                   ;(6) SETS THE "RRFLAG" IF RELOCATION IS REQUIRED TO TEST THIS BANK
 6869                                   ;    HOWEVER, IT COMPLEMENTS THIS FLAG IF THE RELOCATION FLAG "RLFLAG" IS SET
 6870                                   ;    (THIS IS NECESSARY FOR THE USE OF THE RECURSIVE "MODE" SUBROUTINES)
 6871                                   ;    BUT, THE "RRFLAG" IS ALWAYS SET TO DISABLE TESTING IF FIELD SERVICE MODE
 6872                                   ;      "SELECTED BANKS" ARE BEING TESTED AND THIS BANK IS NOT SELECTED.
 6873                                   ;(7) SETS THE "BMFLAG" IF THE BANK IS A BAD MEMORY
 6874                                   ;    HOWEVER, IT COMPLEMENTS THIS FLAG IF THE "WORST" FLAG IS NOT SET
 6875                                   ;    (THIS IS NECESSARY FOR THE USE OF THE RECURSIVE "MODE" SUBROUTINES)
 6876 042422                                PUSH    R0,R1,R2
      042422  010046                                                                  MOV R0,-(SP)
      042424  010146                                                                  MOV R1,-(SP)
      042426  010246                                                                  MOV R2,-(SP)
 6877 042430                                CLEAR   MKFLAG,KPFLAG
      042430  005037  002126                                                         CLR  MKFLAG
      042434  005037  002122                                                         CLR  KPFLAG
 6878 042440                                SET     ACFLAG
      042440  012737  177777  002124                                                MOV  #-1,ACFLAG
 6879 042446                                CLEAR   PFLAG,RRFLAG,BMFLAG
      042446  005037  002130                                                         CLR  PFLAG
      042452  005037  002132                                                         CLR  RRFLAG
      042456  005037  002136                                                         CLR  BMFLAG
 6880 042462  013701  002106                MOV     BANK,R1
 6881 042466  070127  000006                MUL     #6,R1                ;R0 = BANK * 6
 6882 042472  010137  002110                MOV     R1,BANKINDEX
 6883 042476  032761  010000  003016        BIT     #BIT12,CONFIG(R1)    ;PROTECTED REGION OF MK11 MEMORY?
 6884 042504  001406                       BEQ     1$                   ;NO - SKIP
 6885 042506                                SET     KPFLAG,RRFLAG
      042506  012737  177777  002122                                                MOV  #-1,KPFLAG
      042514  012737  177777  002132                                                MOV  #-1,RRFLAG
 6886 042522  012700  000020        1$:     MOV     #MASTER,R0
 6887 042526                                FOR R2 := #0 TO SLAVES
      042526  005002                                                                CLR R2
      042530                                                                 B63:::::::
 6888 042530                                  IF R0 SET.IN CPUBIT AND R0 OFF.IN CONFIG(R1)
      042530  030037  002114                                                         BIT R0,CPUBIT
      042534  001405                                                                BEQ L461
      042536  030061  003016                                                         BIT R0,CONFIG(R1)
      042542  001002                                                                BNE L461
 6889 042544  005037  002124                    CLR ACFLAG
 6890 042550                                  END ;OF IF R0
      042550                                                                 L461:::::::
 6891 042550  006300                          ASL   R0
 6892 042552                                END ;OF FOR R2
      042552  005202                                                                INC R2
      042554  020237  002730                                                         CMP R2,SLAVES
      042560  003763                                                                BLE B63
      042562                                                                 E63:::::::
```

```
6893 042562 016100 003016          2$:   MOV     CONFIG(R1),R0
6894 042566 042700 117777                BIC     #^C60000,R0             ;GET MEMORY TYPE BITS
6895 042572 022700 020000                CMP     #20000,R0               ;IS IT AN MK11?
6896 042576 001003                       BNE     3$                      ;NO - SKIP
6897 042600                              SET     MKFLAG
     042600 012737 177777 002126                                                MOV  #-1,MKFLAG
6898 042606 032761 100000 003016   3$:   BIT     #BIT15,CONFIG(R1)       ;BANK = PROGRAM SPACE?
6899 042614 001406                       BEQ     5$                      ;NO - SKIP
6900 042616                              SET     PFLAG,RRFLAG
     042616 012737 177777 002130                                                MOV  #-1,PFLAG
     042624 012737 177777 002132                                                MOV  #-1,RRFLAG
6901 042632 005737 002134          5$:   TST     RLFLAG                  ;IS PROGRAM RELOCATED?
6902 042636 001402                       BEQ     6$                      ;NO - SKIP
6903 042640 005137 002132                COM     RRFLAG                  ;YES - COMPLEMENT RELOCATION REQUIRED FLAG
6904 042644 032761 004000 003016   6$:   BIT     #BIT11,CONFIG(R1)       ;ERRORS PRESENT IN THIS BANK?
6905 042652 001403                       BEQ     8$                      ;NO - SKIP
6906 042654                              SET     BMFLAG
     042654 012737 177777 002136                                                MOV  #-1,BMFLAG
6907 042662 005737 002712          8$:   TST     WORST                   ;IS THIS A WORST FIRST PASS?
6908 042666 001002                       BNE     9$                      ;YES - SKIP
6909 042670 005137 002136                COM     BMFLAG                  ;NO - COMPLEMENT BAD MEMORY FLAG
6910 042674                        9$:   IF SELONLY IS TRUE AND #BIT14 OFF.IN CONFIG+2(R1)
     042674 005737 002002                                                       TST SELONLY
     042700 001407                                                              BEQ L462
     042702 032761 040000 003020                                                BIT #BIT14,CONFIG+2(R1)
     042710 001003                                                              BNE L462
6911 042712                                SET   RRFLAG
     042712 012737 177777 002132                                                MOV  #-1,RRFLAG
6912 042720                              END ;OF IF SELONLY
     042720                                                             L462:::::::
6913 042720                              POP     R2,R1,R0
     042720 012602                                                              MOV (SP)+,R2
     042722 012601                                                              MOV (SP)+,R1
     042724 012600                                                              MOV (SP)+,R0
6914 042726 000207                       RETURN
```

```
 6918 042730                            BANKOK: SUBTST  <<SUBR  BANK OK?>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    BANK OK?
                                        ;*****************************************************************************
 6919                                           ;TEST TO INSURE THAT THE TYPE OF MEMORY IN THE PRESENT BANK
 6920                                           ;IS OF THE TYPE WE ARE TESTING 'TMFLAG'.
 6921                                           ;RESULT IS RETURNED IN THE CONDITION CODES (OK - (-0)).
 6922 042730  013700  002140                    MOV     TMFLAG,R0
 6923 042734  005100                            COM     R0
 6924 042736  013701  002126                    MOV     MKFLAG,R1
 6925 042742  074001                            XOR     R0,R1
 6926 042744  000207                            RETURN                          ;OK = (=OK)
 6927
 6928 042746                            INCRPT:
 6929 042746                            INCPAT: SUBTST  <<SUBR  INCREMENT PATTERN TESTING MK11'S>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    INCREMENT PATTERN TESTING MK11'S
                                        ;*****************************************************************************
 6930                                           ;INCREMEMT THE PATTERN & SET UP THE CONDITION CODES
 6931                                           ;RESULT - Z BIT SET INDICATES OVERFLOW
 6932 042746  005237  002120                    INC     PATTERN
 6933 042752  022737  000040  002120            CMP     #40,PATTERN             ;SET UP CONDITION CODES
 6934 042760  000207                            RETURN                          ,NOT EQUAL TO ZERO IS GOOD (NO OVERFLOW)
 6935
 6936 042762                            SETPAT:
 6937 042762                            HIPAT:  SUBTST  <<SUBR  SET HIGHEST PATTERN TESTING TYPE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    SET HIGHEST PATTERN TESTING TYPE
                                        ;*****************************************************************************
 6938 042762  012737  000037  002120            MOV     #37,PATTERN             ;SET HIGHEST PATTERN
 6939 042770  000207                            RETURN
 6940
 6941 042772                            INCBNK: SUBTST  <<SUBR  INCREMENT BANK & TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    INCREMENT BANK & TEST
                                        ;*****************************************************************************
 6942                                           ;RESULTS RETURNED IN CONDITION CODES
 6943 042772  005237  002106                    INC     BANK
 6944 042776  022737  000170  002106            CMP     #120.,BANK              ;TOO FAR?
 6945 043004  000207                            RETURN
```

```
 6948 043006                            INCMAR: SUBTST  <<SUBR  INCREMENT MARGINS & TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    INCREMENT MARGINS & TEST
                                        ;*****************************************************************************
 6949                                           ;SKIPS THE SPECIAL CASE (MARGIN CANNOT = 1)
 6950                                           ;RETURNS THE RESULT OF MARGIN OVERFLOW IN THE CONDITION CODES
 6951                                           .ENABL  LSB
 6952 043006                                    IF #SW11 OFF.IN @SWR AND QVFLAG IS FALSE
      043006  032777  004000  137752                                                    BIT #SW11,@SWR
      043014  001004                                                                    BNE L463
      043016  005737  002440                                                            TST QVFLAG
      043022  001001                                                                    BNE L463
 6953 043024                                      GOTO 1$
      043024  000410                                                                    BR 1$
 6954 043026                                    END ;OF IF #SW11
      043026                                                                  L463:::::::
 6955 043026  013737  002112  002376           MOV     MARGIN,OLDMARGIN
 6956 043034  005037  002112                   CLR     MARGIN                  ;YES - SET MARGIN TO ZERO
 6957 043040  004737  043300                   CALL    COREHISTORY
 6958 043044  000435                           BR      3$
 6959 043046  013737  002112  002376  1$:      MOV     MARGIN,OLDMARGIN
 6960 043054  005237  002112                   INC     MARGIN
 6961 043060  022737  000001  002112           CMP     #1,MARGIN               ;SPECIAL CASE?
 6962 043066  001002                           BNE     2$                      ;NO - SKIP
 6963 043070  005237  002112                   INC     MARGIN                  ;YES - SET MARGIN TO "2"
 6964 043074                            2$:     IF MKFLAG IS FALSE AND MARGIN NE #6
      043074  005737  002126                                                            TST MKFLAG
      043100  001005                                                                    BNE L464
      043102  023727  002112  000006                                                    CMP MARGIN,#6
      043110  001401                                                                    BEQ L464
 6965 043112                                      GOTO 3$
      043112  000412                                                                    BR 3$
 6966 043114                                    END ;OF IF MKFLAG
      043114                                                                  L464:::::::
 6967 043114                                    IF MKFLAG IS TRUE AND MARGIN NE #4
      043114  005737  002126                                                            TST MKFLAG
      043120  001405                                                                    BEQ L465
      043122  023727  002112  000004                                                    CMP MARGIN,#4
      043130  001401                                                                    BEQ L465
 6968 043132                                      GOTO 3$
      043132  000402                                                                    BR 3$
 6969 043134                                    END ;OF IF MKFLAG
      043134                                                                  L465:::::::
 6970 043134  005037  002112                   CLR     MARGIN                  ;YES - SET MARGIN TO ZERO
 6971 043140  004737  043300            3$:     CALL    COREHISTORY
 6972 043144  005737  002112                   TST     MARGIN                  ;SET CONDITION CODE - DONE IF Z BIT SET
 6973 043150  000207                           RETURN
 6974                                           .DSABL  LSB
 6975
 6976 043152                            DECMAR: SUBTST  <<DECREMENT MARGINS & TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       DECREMENT MARGINS & TEST
                                        ;*****************************************************************************
 6977                                           ;SKIPS THE SPECIAL CASE (MARGIN CANNOT = 1)
 6978                                           ;RETURNS THE RESULT OF MARGIN UNDERFLOW IN THE CONDITION CODES
 6979 043152  013737  002112  002376           MOV     MARGIN,OLDMARGIN
 6980 043160  005337  002112                   DEC     MARGIN
```

```
6981 043164  022737  000001  002112          CMP     #1,MARGIN               ;SPECIAL CASE?
6982 043172  001002                          BNE     1$                      ;NO - SKIP
6983 043174  005337  002112                  DEC     MARGIN                  ;YES - SET MARGIN TO '0'
6984 043200  004737  043300          1$:     CALL    COREHISTORY
6985 043204  005737  002112                  TST     MARGIN                  ;SETUP CONDITION CODES - NEGATIVE IS UNDERFLOW
6986 043210  000207                          RETURN
```

```
 6989 043212                            SETMAR: SUBTST  <<SUBR  SET HIGHEST MARGIN>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    SET HIGHEST MARGIN
                                        ;*****************************************************************************
 6990
 6991                                           ;RECOGNIZES THE ''INHIBIT MARGINS SWITCH''
                                                .ENABL  LSB
 6992 043212                                    IF #SW11 SET.IN @SWR OR QVFLAG IS TRUE
      043212  032777  004000  137546                                                    BIT #SW11,@SWR
      043220  001003                                                                    BNE L466
      043222  005737  002440                                                            TST QVFLAG
      043226  001401                                                                    BEQ L467
      043230                                                                  L466:;;;;;;
 6993 043230                                      GOTO 1$
      043230  000420                                                                    BR 1$
 6994 043232                                    END ;OF IF #SW11
      043232                                                                  L467:;;;;;;
 6995 043232  013737  002112  002376            MOV     MARGIN,OLDMARGIN
 6996 043240                                    IF MKFLAG IS FALSE
      043240  005737  002126                                                            TST MKFLAG
      043244  001004                                                                    BNE L470
 6997 043246  012737  000005  002112              MOV   #5,MARGIN               ;HIGHEST MJ11 MARGIN
 6998 043254                                    ELSE
      043254  000403                                                                    BR L471
      043256                                                                  L470:;;;;;;
 6999 043256  012737  000003  002112              MOV   #3,MARGIN               ;HIGHEST MK11 MARGIN
 7000 043264                                    END ;OF IF MKFLAG
      043264                                                                  L471:;;;;;;
 7001 043264  004737  043300                    CALL    COREHISTORY
 7002 043270  000402                            BR      2$                    ;SKIP
 7003 043272  005037  002112            1$:     CLR     MARGIN                ;SET MARGIN TO ''0''
 7004 043276  000207                    2$:     RETURN
 7005                                           .DSABL  LSB
 7006 043300                            COREHISTORY:SUBTST      <<SUBR  REWRITE CORE HISTORY>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    REWRITE CORE HISTORY
                                        ;*****************************************************************************
 7007 043300                                    IF MKFLAG IS FALSE AND NULLFLAG IS FALSE
      043300  005737  002126                                                            TST MKFLAG
      043304  001041                                                                    BNE L472
      043306  005737  002436                                                            TST NULLFLAG
      043312  001036                                                                    BNE L472
 7008 043314                                      IF OLDMARGIN NE MARGIN
      043314  023737  002376  002112                                                    CMP OLDMARGIN,MARGIN
      043322  001432                                                                    BEQ L473
 7009 043324                                        IF OLDMARGIN EQ #4 OR OLDMARGIN EQ #5 OR MARGIN EQ #4 OR MARGIN EQ #5
      043324  023727  002376  000004                                                    CMP OLDMARGIN,#4
      043332  001414                                                                    BEQ L474
      043334  023727  002376  000005                                                    CMP OLDMARGIN,#5
      043342  001410                                                                    BEQ L474
      043344  023727  002112  000004                                                    CMP MARGIN,#4
      043352  001404                                                                    BEQ L474
      043354  023727  002112  000005                                                    CMP MARGIN,#5
      043362  001012                                                                    BNE L475
      043364                                                                  L474:;;;;;;
 7010 043364  013700  002112                      MOV     MARGIN,R0
 7011 043370  006300                              ASL     R0
 7012 043372  010037  177750                      MOV     R0,MAINT              ;SET MARGINS
```

```
 7013
 7014 043376                                    LET R2 :- ONES
      043376  013702  002726                                                MOV ONES,R2
 7015 043402  004737  035344                    CALL      BACKGND
 7016 043406  104511                            INVALIDATE
 7017 043410                                  END ;OF IF
      043410                                                                L475:::::::
 7018 043410                                END ;OF IF
      043410                                                                L473:::::::
 7019 043410                              END ;OF IF
      043410                                                                L472:::::::
 7020 043410  005037  002436                  CLR       NULLFLAG
 7021 043414  000207                         RETURN
```

```
                                BOOT:   SUBTST  <<BOOTSTRAP ROUTINE>>
                                ;*****************************************************************************
                                ;*SUBTEST        BOOTSTRAP ROUTINE
                                ;*****************************************************************************
                                        ;INITIALIZE ALL CSR'S
                                        ;CLEAR ANY MARGINS
                                        ;UNRELOCATE IF NECESSARY
                                        ;FLUSH OUT ANY DBE'S
                                        ;TURN OFF MEMORY MANAGEMENT
                                        ;TURN OFF THE UNIBUS MAP
                                        ;BOOT RK0 OR RK1
043416  104472                         ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
043420                                  SET4    #BOOT1          ;TRAPS TO 4 GOTO BOOT1
043420  012737  043460  000004          MOV     #BOOT1,4
                                        .DSABL  CRF
043426  005037  177750                  CLR     MAINT
043432                                  IF RLFLAG IS TRUE THEN $CALL UNRELOCATE
043432  005737  002134                                                          TST RLFLAG
043436  001402                                                                 BEQ L476
043440  004737  041604                                                         JSR PC,UNRELOCATE
043444                                                                 L476:::::::
043444  004737  024754                  CALL    MT0030          ;FLUSH OUT DBE'S
043450  104421                          DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT
043452  042737  000040  172516          BIC     #BIT5,MMR3                      ;TURN OFF THE UNIBUS MAP
043460  005001                  BOOT1:  CLR     R1
043462  000005                  1$:     RESET
043464  012700  177406                  MOV     #177406,R0
043470  010160  000004                  MOV     R1,4(R0)
043474  012710  177400                  MOV     #177400,(R0)
043500  012740  000005                  MOV     #5,-(R0)
043504  105710                  2$:     TSTB    (R0)
043506  100376                          BPL     2$
043510  062701  020000                  ADD     #BIT13,R1
043514  005710                          TST     (R0)
043516  100761                          BMI     1$
043520  005007                          CLR     PC
```

```
                                EXIT:   SUBTST  <<HALT PROGRAM>>
                                ;*************************************************************************
                                ;*SUBTEST        HALT PROGRAM
                                ;*************************************************************************
7054 043522  004737  043554             CALL    SHUTUP
7055 043526                     EXIT2:  IF APTFLAG IS TRUE OR ACTFLAG IS TRUE
     043526  005737  002444                                                    TST APTFLAG
     043532  001003                                                            BNE L477
     043534  005737  002442                                                    TST ACTFLAG
     043540  001402                                                            BEQ L500
     043542                                                          L477:::::::
7056 043542  000777                       BR      .
7057 043544                             ELSE
     043544  000403                                                            BR L501
     043546                                                          L500:::::::
7058 043546  000000             $EXHALT:  HALT
7059 043550  000137  004352               JMP     START
7060 043554                             END ;OF IF APTFLAG
     043554                                                          L501:::::::
7061
7062 043554                     SHUTUP: SUBTST  <<SHUTDOWN DIAGNOSTIC>>
                                ;*************************************************************************
                                ;*SUBTEST        SHUTDOWN DIAGNOSTIC
                                ;*************************************************************************
7063                                    ;INITIALIZE ALL CSR'S
7064                                    ;CLEAR MARGINS
7065                                    ;UNRELOCATE
7066                                    ;FLUSH OUT DBE'S
7067                                    ;RESTORE LOADERS
7068                                    ;TURN OFF MEMORY MANAGEMENT
7069                                    ;UNMAP THE UNIBUS MAP
7070                                    ;CLEAR MULTIPROCESSING LOCK
7071 043554  104472                    ECCINIT         ;TRAP ON DOUBLE BIT ERRORS (NORMAL)
7072 043556  005037  177750             CLR     MAINT
7073 043562                             IF RLFLAG IS TRUE THEN $CALL UNRELOCATE
     043562  005737  002134                                                    TST RLFLAG
     043566  001402                                                            BEQ L502
     043570  004737  041604                                                    JSR PC,UNRELOCATE
     043574                                                          L502:::::::
7074 043574                             IF QUICK IS FALSE
     043574  005737  002536                                                    TST QUICK
     043600  001002                                                            BNE L503
7075 043602  004737  024754               CALL  MT0030          ;FLUSH OUT DBE'S
7076 043606                             END ;OF IF QUICK
     043606                                                          L503:::::::
7077 043606  012700  000001             MOV     #1,R0           ;DESTINATION BANK
7078 043612  013701  002710             MOV     LOADHOME,R1     ;SOURCE BANK
7079 043616  004737  042072             CALL    BANKMOV
7080 043622  104421                    DEENERGIZE              ;TURN OFF MEMORY MANAGEMENT
7081 043624  042737  000040  172516     BIC     #BIT5,MMR3              ;TURN OFF UNIBUS MAP
7082 043632  005037  002670             CLR     LOCK
7083 043636  000207                    RETURN
7084
7085 043640                     APTDOWN:SUBTST  <<APT SHUTDOWN SEQUENCE>>
                                ;*************************************************************************
                                ;*SUBTEST        APT SHUTDOWN SEQUENCE
                                ;*************************************************************************
```

```
                                        MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
 043640  010346                                                                MOV R3,-(SP)
 043642  012703  000000                 MOV     #0,R3
 043646  004737  040700                 CALL    MAPPER
                                        .DSABL  CRF
 043652  012603                                                                MOV (SP)+,R3
                                        SUPERVISOR              ;ENTER SUPERVISOR MODE
 043654  052737  040000  177776         BIS     #BIT14,PSW              ;DO IT TO IT
                                        .DSABL  CRF
 043662  012737  043640  060024         MOV     #APTDOWN,FIRST+24
 043670  012737  000340  060026         MOV     #340,FIRST+26
 043676  012737  000000  123640         MOV     #0,FIRST+APTDOWN
 043704  104417                         KERNEL                  ;ENTER KERNEL MODE
 043706  000000             APTHLT:     HALT
```

```
7095 043710                             SUBTST  <<BLOCK MOVE SUBROUTINE>>
                                ;*****************************************************************
                                ;*SUBTEST        BLOCK MOVE SUBROUTINE
                                ;*****************************************************************
7096                                    ;BLOCK3 HAS 3 ARGUEMENTS
7097                                    ;BLOCK2 HAS 2 ARGUEMENTS
7098                                    ;BLOCK1 HAS 1 ARGUEMENTS
7099                                    ;
7100                                    ;ALL ARE CALLED BY THE BMOV MACRO
7101                                    .ENABL  LSB
7102 043710                     BLOCK1: PUSH    R0,R1,R2
     043710  010046                                                    MOV R0,-(SP)
     043712  010146                                                    MOV R1,-(SP)
     043714  010246                                                    MOV R2,-(SP)
7103 043716  012702  177640            MOV     #FASTCITY,R2
7104 043722  012701  000020            MOV     #16.,R1
7105 043726  000413                    BR      3$
7106
7107 043730                     BLOCK2: PUSH    R0,R1,R2
     043730  010046                                                    MOV R0,-(SP)
     043732  010146                                                    MOV R1,-(SP)
     043734  010246                                                    MOV R2,-(SP)
7108 043736  012701  000020            MOV     #16.,R1
7109 043742  000404                    BR      2$
7110
7111 043744                     BLOCK3: PUSH    R0,R1,R2
     043744  010046                                                    MOV R0,-(SP)
     043746  010146                                                    MOV R1,-(SP)
     043750  010246                                                    MOV R2,-(SP)
7112 043752  012501                    MOV     (R5)+,R1
7113 043754  012502            2$:     MOV     (R5)+,R2
7114 043756  012500            3$:     MOV     (R5)+,R0
7115
7116 043760  012022            1$:     MOV     (R0)+,(R2)+
7117 043762  077102                    SOB     R1,1$
7118 043764                             POP     R2,R1,R0
     043764  012602                                                    MOV (SP)+,R2
     043766  012601                                                    MOV (SP)+,R1
     043770  012600                                                    MOV (SP)+,R0
7119 043772  000205                    RTS     R5
7120                                    .DSABL  LSB
```

```
                                        .SBTTL  FIELD SERVICE MODE
                                ;
043774                          FIELDSERVICE:SUBTST     <<SUBR  FIELD SERVICE COMMAND MODE>>
                                ;*****************************************************************************
                                ;*SUBTEST        SUBR    FIELD SERVICE COMMAND MODE
                                ;*****************************************************************************
                                ;
043774  104415                          SAVREG
043776                          TYPE    MSG020          ;FIELD SERVICE COMMAND MODE
043776  104401  012170                  TYPEIT  ,MSG020
                                        .DSABL  CRF
                                ;
044002                                  IF RLFLAG IS TRUE OR NOFSMODE IS TRUE
044002  005737  002134                                                          TST RLFLAG
044006  001003                                                                  BNE L504
044010  005737  002526                                                          TST NOFSMODE
044014  001404                                                                  BEQ L505
044016                                                                  L504:::::::
044016                            TYPE  MSG048          ;NOT AVAILABLE NOW - TRY LATER!
044016  104401  114303                  TYPEIT  ,MSG048
                                        .DSABL  CRF
044022  104416                          RESREG
044024  000207                          RETURN
044026                                  END ;OF IF RLFLAG
044026                                                                  L505:::::::
044026                                  PUSH    CONTRL,CSRNO,KAMIKAZE   ;SAVE CACHE STATUS
044026  013746  177746                                                          MOV CONTRL,-(SP)
044032  013746  002256                                                          MOV CSRNO,-(SP)
044036  013746  002010                                                          MOV KAMIKAZE,-(SP)
044042  104424                          CACHOFF                 ;TURN CACHE OFF
044044                                  SET     KAMIKAZE
044044  012737  177777  002010                                                  MOV  #-1,KAMIKAZE
044052                          FS1:    TYPE    MSG026          ;COMMAND:
044052  104401  113371                  TYPEIT  ,MSG026
                                        .DSABL  CRF
044056  104414                          RDDEC                   ;READ A DECIMAL NUMBER
044060                                  POP     R0              ;COMMAND --> R0
044060  012600                                                                  MOV (SP)+,R0
044062  020027  000024                  CMP     R0,#20.
044066  101403                          BLOS    1$
044070                                  TYPE    MSG021
044070  104401  112224                  TYPEIT  ,MSG021
                                        .DSABL  CRF
044074  000766                          BR      FS1
044076                          1$:     CASE R0
044076  010046                                                                  MOV R0,-(SP)
044100  006316                                                                  ASL @SP
044102  004737  044160                                                          JSR PC,L506
044106  044170                            FSCMD0                ;EXIT FIELD SERVICE COMMANDS
044110  044256                            FSCMD1                ;READ CSR
044112  044346                            FSCMD2                ;LOAD CSR
044114  044520                            FSCMD3                ;EXAMINE MEMORY
044116  044764                            FSCMD4                ;MODIFY MEMORY
044120  045274                            FSCMD5                ;SELECT BANK,MARGIN, & PATTERN
044122  046152                            FSCMD6                ;TYPE CONFIGURATION MAP
044124  046160                            FSCMD7                ;BATTERY BACKUP - P/F TEST
044126  046510                            FSCMD8                ;SOB-A-LONG TEST
044130  047104                            FSCMD9                ;SUPER TIGHT SCOPE LOOP
```

```
                        FIELD SERVICE COMMAND MODE

 7154 044132  047550                FCMD10          ;ERROR SUMMARY
 7155 044134  047734                FCMD11          ;REFRESH TEST
 7156 044136  050330                FCMD12          ;SET FILL COUNT
 7157 044140  050356                FCMD13          ;ENTER KAMIKAZE MODE
 7158 044142  050400                FCMD14          ;EXIT KAMIKAZE MODE
 7159 044144  050420                FCMD15          ;TURN CACHE OFF
 7160 044146  050436                FCMD16          ;TURN CACHE ON
 7161 044150  050454                FCMD17          ;RUN ONLY MULTIPORT TESTS
 7162 044152  050470                FCMD18          ;RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS
 7163 044154  050502                FCMD19          ;TEST ONLY SELECTED BANKS
 7164 044156  050566                FCMD20          ;RESUME TESTING ALL BANKS
 7165 044160                      END ;OF CASE
      044160                                                      L506:;;;;;;;
      044160  062616                                                    ADD (SP)+,@SP
      044162  013646                                                    MOV @(SP)+,-(SP)
      044164  004736                                                    JSR PC,@(SP)+
 7166 044166  000731                BR      FS1
```

```
7169 044170                                  FSCMD0: SUBTST  <<COMMAND 0     EXIT>>
                                             ;*******************************************************************
                                             ;*SUBTEST        COMMAND 0       EXIT
                                             ;*******************************************************************
7170 044170                                          TYPE    MSG103          ;LEAVING FIELD SERVICE MODE
     044170  104401  116364                          TYPEIT  ,MSG103
                                                     .DSABL  CRF
7171 044174  062706  000002                          ADD     #2,SP
7172 044200                                          IF SKIPKAMI IS TRUE
     044200  005737  002012                                                                          TST SKIPKAMI
     044204  001405                                                                                  BEQ L507
7173 044206  062706  000002                            ADD   #2,SP                   ;THROW AWAY OLD KAMIKAZE FLAG
7174 044212  005037  002012                            CLR   SKIPKAMI
7175 044216                                          ELSE
     044216  000402                                                                                  BR L510
     044220                                                                                  L507:;;;;;;
7176 044220                                            POP   KAMIKAZE                ;RESTORE OLD KAMIKAZE FLAG
     044220  012637  002010                                                                          MOV (SP)+,KAMIKAZE
7177 044224                                          END ;OF IF SKIPKAMI
     044224                                                                                  L510:;;;;;;
7178 044224                                          POP     CSRNO
     044224  012637  002256                                                                          MOV (SP)+,CSRNO
7179 044230                                          IF CACHK EQ #BIT0!BIT2!BIT3.BIT8.BIT9              ;IF CACHE IS OFF
     044230  023727  002700  001415                                                                  CMP CACHK,#BIT0!BIT2!BIT3!BI
     044236  001003                                                                                  BNE L511
7180 044240  062706  000002                            ADD   #2,SP                   ;THROW AWAY CACHE STATUS
7181 044244                                          ELSE
     044244  000402                                                                                  BR L512
     044246                                                                                  L511:;;;;;;
7182 044246                                            POP   CONTRL                  ;RESTORE CACHE STATUS
     044246  012637  177746                                                                          MOV (SP)+,CONTRL
7183 044252                                          END ;OF IF CACHK
     044252                                                                                  L512:;;;;;;
7184 044252  104416                                  RESREG
7185 044254  000207                                  RETURN
7186
7187 044256                                  FSCMD1: SUBTST  <<FS     COMMAND 1       READ CSR>>
                                             ;*******************************************************************
                                             ;*SUBTEST        FS      COMMAND 1       READ CSR
                                             ;*******************************************************************
7188 044256  004737  050630                          CALL    WHICHCSR
7189 044262  010637  002374                          MOV     SP,FSSTACK
7190 044266                                          SET4    #1$             ;TRAPS TO 4 GOTO 1$
     044266  012737  044322  000004                  MOV     #1$,4
                                                     .DSABL  CRF
7191 044274  104426                                  READCSR
7192 044276                                          SET     NOERROR
     044276  012737  177777  002530                                                                  MOV  #-1,NOERROR
7193 044304  104026                                  ERROR   +26             ;USE ERROR ROUTINE FOR PRINTOUT
7194 044306                                          RES4                    ;RESET TRAPS TO 4 TO DEFAULT
     044306  012737  036726  000004                  MOV     #TIMEOUT,4
     044314  005037  177766                          CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                             ;THAT A EXPECTED TRAP COULD HAVE SET
                                                     .DSABL  CRF
7195 044320  000207                                  RETURN
7196 044322                                  1$:     TYPE    MSG025          ;THIS CSR DOES NOT EXIST
     044322  104401  113340                          TYPEIT  ,MSG025
```

```
                                                .DSABL  CRF
                                                MOV     FSSTACK,SP
 7197 044326  013706  002374                    RES4                    ;RESET TRAPS TO 4 TO DEFAULT
 7198 044332
      044332  012737  036726  000004            MOV     #TIMEOUT,4
      044340  005037  177766                    CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                        ;THAT A EXPECTED TRAP COULD HAVE SET
                                                .DSABL  CRF
 7199 044344  000207                            RETURN
```

```
7202 044346                                FSCMD2: SUBTST  <<FS    COMMAND 2       LOAD CSR>>
                                           ;*****************************************************************
                                           ;*SUBTEST       FS      COMMAND 2       LOAD CSR
                                           ;*****************************************************************
7203 044346  004737  050630                        CALL    WHICHCSR
7204 044352  010637  002374                        MOV     SP,FSSTACK
7205 044356                                        SET4    #1$             ;TRAPS TO 4 GOTO 1$
     044356  012737  044474  000004                MOV     #1$,4
                                                   .DSABL  CRF
7206 044364  104426                                READCSR
7207 044366                                        TYPE    MSG027
     044366  104401  113403                        TYPEIT  ,MSG027
                                                   .DSABL  CRF
7208 044372                                        SET     NOERROR                                 MOV  #-1,NOERROR
     044372  012737  177777  002530
7209 044400  104026                                ERROR   +26             ;USE ERROR ROUTINE FOR PRINTOUT
7210 044402                                        RES4                    ;RESET TRAPS TO 4 TO DEFAULT
     044402  012737  036726  000004                MOV     #TIMEOUT,4
     044410  005037  177766                        CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                           ;THAT A EXPECTED TRAP COULD HAVE SET
                                                   .DSABL  CRF
7211 044414                                        TYPE    MSG023          ;FIRST CSR WORD
     044414  104401  113274                        TYPEIT  ,MSG023
                                                   .DSABL  CRF
7212 044420  104413                                RDOCT                   ;READ AN OCTAL NUMBER
7213 044422                                        POP     CSR             ;PUT IN IN LOC ''CSR''
     044422  012637  002144                                                                     MOV (SP)+,CSR
7214 044426                                        TYPE    MSG024          ;2ND CSR WORD
     044426  104401  113316                        TYPEIT  ,MSG024
                                                   .DSABL  CRF
7215 044432  104413                                RDOCT                   ;READ AN OCTAL NUMBER
7216 044434                                        POP     CSR+2           ;PUT IN IN LOC ''CSR+2''
     044434  012637  002146                                                                     MOV (SP)+,CSR+2
7217 044440                                        SET     TWOCSRS                                 MOV  #-1,TWOCSRS
     044440  012737  177777  002600
7218 044446  104425                                LOADCSR
7219 044450  005037  002600                        CLR     TWOCSRS
7220 044454  104426                                READCSR
7221 044456                                        TYPE    MSG028
     044456  104401  113420                        TYPEIT  ,MSG028
                                                   .DSABL  CRF
7222 044462                                        SET     NOERROR                                 MOV  #-1,NOERROR
     044462  012737  177777  002530
7223 044470  104026                                ERROR   +26             ;USE FOR PRINTOUT - NOT AN ERROR
7224 044472  000207                                RETURN
7225 044474                                1$:     TYPE    MSG025          ;THIS CSR DOES NOT EXIST
     044474  104401  113340                        TYPEIT  ,MSG025
                                                   .DSABL  CRF
7226 044500  013706  002374                        MOV     FSSTACK,SP
7227 044504                                        RES4                    ;RESET TRAPS TO 4 TO DEFAULT
     044504  012737  036726  000004                MOV     #TIMEOUT,4
     044512  005037  177766                        CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                           ;THAT A EXPECTED TRAP COULD HAVE SET
                                                   .DSABL  CRF
7228 044516  000207                                RETURN
```

```
7231 044520                                FSCMD3: SUBTST  <<FS    COMMAND 3       EXAMINE MEMORY>>
                                           ;*****************************************************************************
                                           ;*SUBTEST       FS      COMMAND 3       EXAMINE MEMORY
                                           ;*****************************************************************************
7232 044520                                        PUSH    BANK,NOPAR,PARTHERE,4
     044520  013746  002106                                                                  MOV BANK,-(SP)
     044524  013746  002100                                                                  MOV NOPAR,-(SP)
     044530  013746  002372                                                                  MOV PARTHERE,-(SP)
     044534  013746  000004                                                                  MOV 4,-(SP)
7233 044540  012737  000002  002100           MOV     #2,NOPAR        ;INDICATE PARITY ACTION
7234 044546                                    TYPE    MSG029          ;EXAMINE MEMORY
     044546  104401  113434                   TYPEIT  ,MSG029
                                             .DSABL  CRF
7235 044552                                1$: TYPE    MSG031          ;PHYSICAL ADDRESS (0-16777776)??
     044552  104401  113473                   TYPEIT  ,MSG031
                                             .DSABL  CRF
7236 044556  104413                          RDOCT                   ;READ OCTAL NUMBER ONTO STACK & $HIOCT
7237 044560  013737  074434  002106          MOV     $HIOCT,BANK     ;PUT MSB'S IN BANK
7238 044566                                    POP     R0              ;PUT LSB'S IN R0
     044566  012600                                                                          MOV (SP)+,R0
7239 044570  000241                            CLC
7240 044572  006100                            ROL     R0
7241 044574  006137  002106                    ROL     BANK
7242 044600  000241                            CLC
7243 044602  006000                            ROR     R0
7244 044604                                    IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TOO HIGH
     044604  023727  002106  000167                                                          CMP BANK,#167
     044612  003357                                                                        BGT 1$
7245 044614  062700  060000                    ADD     #FIRST,R0
7246 044620                                    IF #BIT0 SET.IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
     044620  032700  000001                                                                  BIT #BIT0,R0
     044624  001352                                                                        BNE 1$
7247 044626                                    IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
     044626  020027  157776                                                                  CMP R0,#LAST
     044632  101347                                                                        BHI 1$
7248 044634  012737  044706  002372          MOV     #3$,PARTHERE    ;INCASE OF ABORTS
7249 044642                                    SET4    #4$             ;TRAPS TO 4 GOTO 4$
     044642  012737  044714  000004          MOV     #4$,4
                                             .DSABL  CRF
7250 044650                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
     044650  010346                                                                          MOV R3,-(SP)
     044652  013703  002106                    MOV     BANK,R3
     044656  004737  040700                    CALL    MAPPER
                                             .DSABL  CRF
     044662  012603                                                                        MOV (SP)+,R3
7251 044664                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
     044664  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT!
                                             .DSABL  CRF
7252 044672  011001                            MOV     (R0),R1
7253 044674  104407                            KERNEL                  ;ENTER KERNEL MODE
7254 044676                                    TYPOCS  R1
     044676  010146                            MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
     044700  104403                            TYPOS                   ;;GO TYPE--OCTAL ASCII
     044702     006                           .BYTE   6               ;;TYPE 6 DIGITS
     044703     000                           .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                             .DSABL  CRF
7255 044704  000410                            BR      EXCMD3
```

```
                                                                                                                    MOV (SP)+,4
                                                                                                                    MOV (SP)+,PARTHERE
                                                                                                                    MOV (SP)+,NOPAR
                                                                                                                    MOV (SP)+,BANK
```

```
 7256
 7257 044706                            3$:     TYPE    MSG032                  ;PARITY ABORT
      044706  104401  113533                    TYPEIT  ,MSG032
                                                .DSABL  CRF
 7258 044712  000405                            BR      EXCMD3
 7259
 7260 044714  062706  000004            4$:     ADD     #4,SP                   ;FIX STACK
 7261 044720                                    TYPE    MSG033                  ;TIMEOUT TRAP
      044720  104401  113552                    TYPEIT  ,MSG033
                                                .DSABL  CRF
 7262 044724  000400                            BR      EXCMD3
 7263
 7264 044726  104417                    EXCMD3: KERNEL                  ;ENTER KERNEL MODE
 7265 044730                                    POP     4,PARTHERE,NOPAR,BANK
      044730  012637  000004
      044734  012637  002372
      044740  012637  002100
      044744  012637  002106
 7266 044750                                    RES4                    ;RESET TRAPS TO 4 TO DEFAULT
      044750  012737  036726  000004           MOV     #TIMEOUT,4
      044756  005037  177766                    CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                         ;THAT A EXPECTED TRAP COULD HAVE SET
                                                .DSABL  CRF
 7267 044762  000207                            RETURN
```

```
 7270 044764                            FSCMD4: SUBTST <<FS    COMMAND 4       MODIFY MEMORY>>
                                        ;*****************************************************************
                                        ;*SUBTEST       FS      COMMAND 4       MODIFY MEMORY
                                        ;*****************************************************************
 7271 044764                                    PUSH    BANK,NOPAR,PARTHERE,4
      044764  013746  002106                                                          MOV BANK,-(SP)
      044770  013746  002100                                                          MOV NOPAR,-(SP)
      044774  013746  002372                                                          MOV PARTHERE,-(SP)
      045000  013746  000004                                                          MOV 4,-(SP)
 7272 045004  012737  000003  002100            MOV     #3,NOPAR                ;INDICATE PARITY ACTION
 7273 045012                                    TYPE    MSG036                  ;MODIFY MEMORY
      045012  104401  113712                    TYPEIT  ,MSG036
                                                .DSABL  CRF
 7274 045016                            1$:     TYPE    MSG031          ;PHYSICAL ADDRESS (0-16777776)??
      045016  104401  113473                    TYPEIT  ,MSG031
                                                .DSABL  CRF
 7275 045022  104413                            RDOCT                   ;READ OCTAL NUMBER ONTO STACK & $HIOCT
 7276 045024  013737  074434  002106            MOV     $HIOCT,BANK     ;PUT MSB'S IN BANK
 7277 045032                                    POP     R0              ;PUT LSB'S IN R0
      045032  012600                                                                  MOV (SP)+,R0
 7278 045034  000241                            CLC
 7279 045036  006100                            ROL     R0
 7280 045040  006137  002106                    ROL     BANK
 7281 045044  000241                            CLC
 7282 045046  006000                            ROR     R0
 7283 045050                                    IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TOO HIGH
      045050  023727  002106  000167                                                  CMP BANK,#167
      045056  003357                                                                 BGT 1$
 7284 045060  062700  060000                    ADD     #FIRST,R0
 7285 045064                                    IF #BIT0 SET.IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
      045064  032700  000001                                                          BIT #BIT0,R0
      045070  001352                                                                 BNE 1$
 7286 045072                                    IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
      045072  020027  157776                                                          CMP R0,#LAST
      045076  101347                                                                 BHI 1$
 7287 045100  012737  045146  002372            MOV     #3$,PARTHERE            ;INCASE OF ABORTS
 7288 045106                                    SET4    #4$             ;TRAPS TO 4 GOTO 4$
      045106  012737  045154  000004            MOV     #4$,4
                                                .DSABL  CRF
 7289 045114                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
      045114  010346                                                                 MOV R3,-(SP)
      045116  013703  002106                    MOV     BANK,R3
      045122  004737  040700                    CALL    MAPPER
                                                .DSABL  CRF
      045126  012603                                                                 MOV (SP)+,R3
 7290 045130  104511                            INVALIDATE
 7291 045132                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
      045132  052737  040000  177776            BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
 7292 045140  011001                            MOV     (R0),R1
 7293                                           ;GETTING HERE MEANS WE GOT LUCKY - NO TRAPS
 7294 045142  104417                            KERNEL                  ;ENTER KERNEL MODE
 7295 045144  000410                            BR      5$
 7296
 7297 045146                            3$:     TYPE    MSG032                  ;PARITY ABORT
      045146  104401  113533                    TYPEIT  ,MSG032
                                                .DSABL  CRF
```

```
                                                BR      EXCMD4                  ;EXIT
                                        4$:     ADD     #4,SP           ;FIX STACK
                                                TYPE    MSG033          ;TIMEOUT TRAP
045160  104401  113552                          TYPEIT  ,MSG033
                                                .DSABL  CRF
                                                BR      EXCMD4                  ;EXIT
                                        5$:     TYPE    MSG037                  ;OLD DATA WAS
045166  104401  113731                          TYPEIT  ,MSG037
                                                .DSABL  CRF
045172                                          TYPOCS  R1                      ;PRINT IT
045172  010146                                  MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
045174  104403                                  TYPOS                   ;;GO TYPE--OCTAL ASCII
045176     006                                  .BYTE   6               ;;TYPE 6 DIGITS
045177     000                                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                .DSABL  CRF
045200                                          TYPE    MSG039                  ;INPUT NEW DATA
045200  104401  113766                          TYPEIT  ,MSG039
                                                .DSABL  CRF
045204  104413                                  RDOCT                           ;READ ON OCTAL NUMBER ONTO THE STACK
045206                                          POP     R1                      ;GET NEW NUMBER
045206  012601                                                                  MOV (SP)+,R1
045210                                          SUPERVISOR              ;ENTER SUPERVISOR MODE
045210  052737  040000  177776                  BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
045216  010110                                  MOV     R1,(R0)                 ;PUT IT IN MEMORY
045220  011001                                  MOV     (R0),R1                 ;READ IT AGAIN
045222  104417                                  KERNEL                  ;ENTER KERNEL MODE
045224                                          TYPE    MSG038                  ;DATA IS NOW
045224  104401  113750                          TYPEIT  ,MSG038
                                                .DSABL  CRF
045230                                          TYPOCS  R1                      ;PRINT IT
045230  010146                                  MOV     R1,-(SP)        ;;SAVE R1 FOR TYPEOUT
045232  104403                                  TYPOS                   ;;GO TYPE--OCTAL ASCII
045234     006                                  .BYTE   6               ;;TYPE 6 DIGITS
045235     000                                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                .DSABL  CRF

045236  104417                          EXCMD4: KERNEL                  ;ENTER KERNEL MODE
045240                                          POP     4,PARTHERE,NOPAR,BANK
045240  012637  000004                                                          MOV (SP)+,4
045244  012637  002372                                                          MOV (SP)+,PARTHERE
045250  012637  002100                                                          MOV (SP)+,NOPAR
045254  012637  002106                                                          MOV (SP)+,BANK
045260                                          RES4                    ;RESET TRAPS TO 4 TO DEFAULT
045260  012737  036726  000004                  MOV     #TIMEOUT,4
045266  005037  177766                          CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                        ;THAT A EXPECTED TRAP COULD HAVE SET
                                                .DSABL  CRF
045272  000207                                  RETURN
```

```
 7322 045274                                FSCMD5: SUBTST  <<FS     COMMAND 5       SELECT BANK,MARGIN, & PATTERN>>
                                            ;*****************************************************************************
                                            ;*SUBTEST        FS      COMMAND 5       SELECT BANK,MARGIN, & PATTERN
                                            ;*****************************************************************************
 7323 045274                                        PUSH    BANK,PATTERN,MARGIN,CSRFIRST,PCBUMP,TKVEC,TKVEC+2
      045274  013746  002106                                                                      MOV BANK,-(SP)
      045300  013746  002120                                                                      MOV PATTERN,-(SP)
      045304  013746  002112                                                                      MOV MARGIN,-(SP)
      045310  013746  002336                                                                      MOV CSRFIRST,-(SP)
      045314  013746  002406                                                                      MOV PCBUMP,-(SP)
      045320  013746  000060                                                                      MOV TKVEC,-(SP)
      045324  013746  000062                                                                      MOV TKVEC+2,-(SP)
 7324 045330  013737  002112  002376            MOV     MARGIN,OLDMARGIN
 7325 045336  010637  002374                    MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK POINTER
 7326 045342                                    TYPE    MSG040                  ;SELECT BANK, MARGIN, & PATTERN TEST
      045342  104401  114010                    TYPEIT  ,MSG040
                                                .DSABL  CRF
 7327 045346                            1$:     TYPE    MSG030                  ;BANK(0-167)?
      045346  104401  113454                    TYPEIT  ,MSG030
                                                .DSABL  CRF
 7328 045352  104413                            RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7329 045354                                    POP     BANK                    ;PUT IT IN BANK
      045354  012637  002106                                                                      MOV (SP)+,BANK
 7330 045360                                    IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TO HIGH
      045360  023727  002106  000167                                                              CMP BANK,#167
      045366  003367                                                                             BGT 1$
 7331
 7332 045370  013701  002106                    MOV     BANK,R1
 7333 045374  070127  000006                    MUL     #6,R1
 7334 045400                                    IF CPUBIT OFF.IN CONFIG(R1)
      045400  033761  002114  003016                                                              BIT CPUBIT,CONFIG(R1)
      045406  001003                                                                             BNE L513
 7335 045410                                      TYPE  MSG041                  ;BANK NOT ACCESSABLE
      045410  104401  114055                    TYPEIT  ,MSG041
                                                .DSABL  CRF
 7336 045414                                      GOTO 1$
      045414  000754                                                                            BR 1$
 7337 045416                                    END ;OF IF
      045416                                                                  L513:::::::
 7338
 7339 045416                            2$:     TYPE    MSG042                  ;PATTERN(0-37)?
      045416  104401  114102                    TYPEIT  ,MSG042
                                                .DSABL  CRF
 7340 045422  104413                            RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7341 045424                                    POP     PATTERN                 ;PUT IT IN PATTERN
      045424  012637  002120                                                                      MOV (SP)+,PATTERN
 7342 045430                                    IF PATTERN GT #37 THEN GOTO 2$  ;CHECK FOR PATTERN TO HIGH
      045430  023727  002120  000037                                                              CMP PATTERN,#37
      045436  003367                                                                             BGT 2$
 7343 045440                                    IF PATTERN EQ #0
      045440  005737  002120                                                                     TST PATTERN
      045444  001004                                                                             BNE L514
 7344 045446                                      TYPE  MSG043                  ;PATTERN 0 DATA IS?
      045446  104401  114123                    TYPEIT  ,MSG043
                                                .DSABL  CRF
 7345 045452  104413                              RDOCT                         ;READ AN OCTAL NUMBER ONTO THE STACK
 7346 045454                                      POP   R2                      ;PUT IT IN R2
```

```
      045454  012602                                                        MOV (SP)+,R2
 7347 045456                          END ;OF IF
      045456                                                          L514:::::::
 7348
 7349 045456                  CMD5A:  TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
      045456  104401  114150          TYPEIT  ,MSG044
                                      .DSABL  CRF
 7350 045462  104413                  RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
 7351 045464                          POP     MARGIN                  ;PUT IN IN MARGIN
      045464  012637  002112                                                MOV (SP)+,MARGIN
 7352 045470                          IF MARGIN GT #5 OR MARGIN EQ #1
      045470  023727  002112  000005                                        CMP MARGIN,#5
      045476  003004                                                        BGT L515
      045500  023727  002112  000001                                        CMP MARGIN,#1
      045506  001001                                                       BNE L516
      045510                                                          L515:::::::
 7353 045510                            GOTO CMD5A
      045510  000762                                                        BR CMD5A
 7354 045512                          END ;OF IF
      045512                                                          L516:::::::
 7355 045512                          IF MARGIN NE #0 AND #SW11 SET.IN @SWR
      045512  005737  002112                                                TST MARGIN
      045516  001407                                                       BEQ L517
      045520  032777  004000  135240                                        BIT #SW11,@SWR
      045526  001403                                                       BEQ L517
 7356 045530                            TYPE  MSG045                    ;MARGINS INHIBITED BY SW11
      045530  104401  114175          TYPEIT  ,MSG045
                                      .DSABL  CRF
 7357 045534                            GOTO CMD5A
      045534  000750                                                        BR CMD5A
 7358 045536                          END ;OF IF MARGIN
      045536                                                          L517:::::::
 7359
 7360 045536                          MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
      045536  010346                                                        MOV R3,-(SP)
      045540  013703  002106          MOV     BANK,R3
      045544  004737  040700          CALL    MAPPER
                                      .DSABL  CRF
      045550  012603                                                        MOV (SP)+,R3
 7361 045552  104511                  INVALIDATE
 7362 045554  004737  042422          CALL    EXBANK                  ;SET NEW MARGINS
 7363 045560                          IF RRFLAG IS TRUE
      045560  005737  002132                                                TST RRFLAG
      045564  001403                                                       BEQ L520
 7364 045566                            TYPE  MSG049                    ;BANK REQUIRES RELOCATION
      045566  104401  114343          TYPEIT  ,MSG049
                                      .DSABL  CRF
 7365 045572                            GOTO CMD5C
      045572  000527                                                        BR CMD5C
 7366 045574                          END ;OF IF RRFLAG
      045574                                                          L520:::::::
 7367 045574  004737  043300          CALL    COREHISTORY
 7368 045600                          TYPE    MSG046          ;TO ESCAPE TYPE ANY KEY.
      045600  104401  114231          TYPEIT  ,MSG046
                                      .DSABL  CRF
 7369 045604  012737  046052  000060  MOV     #CMD5C,TKVEC
 7370 045612  012737  000340  000062  MOV     #340,TKVEC+2
```

```
                COMMAND 5       SELECT BANK,MARGIN, & PATTERN

 7371 045620  017700  135150                 MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
 7372 045624  042737  000200  177776         BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
 7373 045632  052777  000100  135132         BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
 7374
 7375 045640  013700  002112                 MOV     MARGIN,R0               ;SET MARGINS
 7376 045644  006300                         ASL     R0                      ;SET MARGINS
 7377
 7378 045646  010037  177750                 MOV     R0,MAINT
 7379
 7380 045652                                 SET     HEADER,MUT
      045652  012737  177777  002724                                                 MOV  #-1,HEADER
      045660  012737  177777  002116                                                 MOV  #-1,MUT
 7381 045666  005037  002362         CMD5B:  CLR     PASFLG
 7382 045672  012737  060000  002336         MOV     #FIRST,CSRFIRST
 7383 045700                                 IF #SW0 SET.IN @SWR
      045700  032777  000001  135060                                                 BIT #SW0,@SWR
      045706  001402                                                                 BEQ L521
 7384 045710  104470                           ECCDIS                        ;DISABLE ERROR CORRECTION
 7385 045712                                 ELSE
      045712  000401                                                                 BR L522
      045714                                                                 L521:::::::
 7386 045714  104502                           CLRCSR                        ;CLEAR MK11 CSRS
 7387 045716                                 END ;OF IF
      045716                                                                 L522:::::::
 7388 045716  012737  000002  002100         MOV     #2,NOPAR                ;PARITY ACTION
 7389 045724  012737  000002  002406         MOV     #2,PCBUMP               ;TRAPS ADD 2 TO PC
 7390 045732  013700  002120                 MOV     PATTERN,R0
 7391 045736  006300                         ASL     R0
 7392 045740  004770  045752                 CALL    @FSPAT(R0)
 7393 045744  005037  002100                 CLR     NOPAR
 7394 045750  000746                         BR      CMD5B                   ;LOOP TILL KEYBOARD INTERRUPT
 7395
 7396 045752  021704                 FSPAT:  MT0000  ;<1 SEC         DATA PATTERN TEST
 7397 045754  021740                         MT0001  ;<1 SEC         ADDRESS TEST
 7398 045756  022000                         MT0002  ;<1 SEC         COMPLEMENT ADDRESS TEST
 7399 045760  022050                         MT0003  ; 1 SEC         3 XOR 9 WORST CASE NOISE TEST
 7400 045762  022216                         MT0004  ; 1 SEC         ROTATING ZEROS TEST
 7401 045764  022300                         MT0005  ; 1 SEC         ROTATING ONES TEST
 7402 045766  022360                         MT0006  ;<1 SEC         INITIAL DATA TEST
 7403 045770  022414                         MT0007  ;<1 SEC         ADDRESS BIT TEST
 7404 045772  022456                         MT0010  ;<1 SEC         BYTE ADDRESSING TEST
 7405 045774  022512                         MT0011  ;<2 SEC         CREATE SINGLE BIT ERROR TEST
 7406 045776  022570                         MT0012  ;<1 SEC         WRITE BYTE CLEARS SBE TEST
 7407 046000  022646                         MT0013  ; 1 SEC         CREATE DOUBLE BIT ERROR TEST
 7408 046002  022722                         MT0014  ; 1 SEC         WRITE INHIBIT DURING DATIP WITH DBE
 7409 046004  023000                         MT0015  ; 1 SEC         WRITE INHIBIT OF BYTE WITH DBE
 7410 046006  023056                         MT0016  ;<1 SEC         WRITE INHIBIT OF WORD WITH DBE
 7411 046010  023134                         MT0017  ;<1 SEC         HOLDING 1'S & 0'S TEST
 7412 046012  023156                         MT0020  ;<1 SEC         MARCHING 1'S & 0'S IN CHECK BITS
 7413 046014  023612                         MT0021  ; 1 SEC         MARCHING 0'S & 1'S TEST
 7414 046016  023734                         MT0022  ;10 SEC         REFRESH & SHIFTING DIAGONAL TEST
 7415 046020  023766                         MT0023  ;10 SEC         SHIFTING DIAGONAL TEST
 7416 046022  024032                         MT0024  ;20 SEC         FAST GALLOPING PATTERN TEST
 7417 046024  024172                         MT0025  ;<1 SEC         INTERRUPT ENABLE TEST
 7418 046026  024240                         MT0026  ;<1 SEC         RANDOM DATA TEST
 7419 046030  024370                         MT0027  ; 1 SEC         UNIQUE BANK TEST
 7420 046032  024754                         MT0030  ; 1 SEC         FLUSH OUT DBE'S TEST
```

```
7421 046034  025214                          MT0031  ; 3 SEC -       SOB-A-LONG TEST
7422 046036  025772                          MT0999;MT0032
7423 046040  025340                          MT0033  ;<1 SEC         WRITE RECOVERY TEST
7424 046042  025530                          MT0034  ;35 SEC         BRANCH GOBBLE TEST
7425 046044  025772                          MT0999;MT0035
7426 046046  025772                          MT0999;MT0036
7427 046050  025772                          MT0999;MT0037
7428
7429 046052  013706  002374          CMD5C:  MOV     FSSTACK,SP              ;RECOVER OLD STACK POINTER
7430 046056  042777  000100  134706          BIC     #BIT6,@$TKS
7431 046064                                  POP     TKVEC+2,TKVEC
     046064  012637  000062                                                  MOV (SP)+,TKVEC+2
     046070  012637  000060                                                  MOV (SP)+,TKVEC
7432 046074  117700  134674                  MOVB    @$TKB,R0                ;GET CHARACTER TO GET RID OF FLAG
7433 046100                                  POP     PCBUMP,CSRFIRST,MARGIN
     046100  012637  002406                                                  MOV (SP)+,PCBUMP
     046104  012637  002336                                                  MOV (SP)+,CSRFIRST
     046110  012637  002112                                                  MOV (SP)+,MARGIN
7434 046114  004737  043300                  CALL    COREHISTORY             ;RESTORE OLD MARGINS
7435 046120                                  POP     PATTERN,BANK
     046120  012637  002120                                                  MOV (SP)+,PATTERN
     046124  012637  002106                                                  MOV (SP)+,BANK
7436 046130                                  MAP     BANK                    ;REMAP OLD BANK
     046130  010346                                                          MOV R3,-(SP)
     046132  013703  002106                  MOV     BANK,R3
     046136  004737  040700                  CALL    MAPPER
                                             .DSABL  CRF
     046142  012603                                                          MOV (SP)+,R3
7437 046144  004737  042422                  CALL    EXBANK
7438 046150  000207                          RETURN
7439
7440 046152                          FSCMD6: SUBTST  <<FS     COMMAND 6       TYPE CONFIGURATION MAP>>
                                     ;*********************************************************************
                                     ;*SUBTEST        FS      COMMAND 6       TYPE CONFIGURATION MAP
                                     ;*********************************************************************
7441 046152  004737  035402                  CALL    PCONFIG
7442 046156  000207                          RETURN
7443
```

```
7447 046160                        FSCMD7: SUBTST  <<FS    COMMAND 7       BATTERY BACKUP TEST>>
                                   ;*********************************************************************
                                   ;*SUBTEST       FS      COMMAND 7       BATTERY BACKUP TEST
                                   ;*********************************************************************
7448 046160                                PUSH    BANK,PATTERN,MARGIN,CSRNO,TKVEC,TKVEC+2
     046160  013746  002106                                                          MOV BANK,-(SP)
     046164  013746  002120                                                          MOV PATTERN,-(SP)
     046170  013746  002112                                                          MOV MARGIN,-(SP)
     046174  013746  002256                                                          MOV CSRNO,-(SP)
     046200  013746  000060                                                          MOV TKVEC,-(SP)
     046204  013746  000062                                                          MOV TKVEC+2,-(SP)
7449 046210                                SET     FS7FLAG
     046210  012737  177777  002546                                                  MOV  #-1,FS7FLAG
7450 046216                                IF #SW0 SET.IN @SWR
     046216  032777  000001  134542                                                  BIT #SW0,@SWR
     046224  001402                                                                 BEQ L523
7451 046226  104470                          ECCDIS                    ;DISABLE ERROR CORRECTION
7452 046230                                ELSE
     046230  000401                                                                 BR L524
     046232                                                          L523:;;;;;;
7453 046232  104502                          CLRCSR                    ;CLEAR MK11 CSRS
7454 046234                                END ;OF IF
     046234                                                          L524:;;;;;;
7455 046234                                TYPE    MSG050          ;BATTERY BACKUP TEST
     046234  104401  114375                TYPEIT  ,MSG050
                                           .DSABL  CRF
7456                                                               ;WRITING & CHECKING ADDRESS PATTERN AS BACKGROUND
7457 046240  004737  024370                CALL    MT0027          ;CREATE & CHECK BACKGROUND
7458 046244  012737  000012  002434        MOV     #10.,TIME
7459 046252                                TYPE    MSG052          ;REMOVE SYSTEM POWER FOR
     046252  104401  114523                TYPEIT  ,MSG052
                                           .DSABL  CRF
7460 046256                                TYPDEC  TIME
     046256  013746  002434                MOV     TIME,-(SP)      ;;SAVE TIME FOR TYPEOUT
     046262  104405                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                           .DSABL  CRF
7461 046264                                TYPE    MSG053          ;SECONDS MAX.
     046264  104401  114554                TYPEIT  ,MSG053
                                           .DSABL  CRF
7462 046270                                TYPE    MSG046          ;TO ESCAPE TYPE ANY KEY
     046270  104401  114231                TYPEIT  ,MSG046
                                           .DSABL  CRF
7463 046274  012737  046336  000060        MOV     #CMD7A,TKVEC
7464 046302  012737  000340  000062        MOV     #340,TKVEC+2
7465 046310  017700  134460                MOV     @$TKB,R0        ;KILL ANY OLD INTERRUPT
7466 046314  042737  000200  177776        BIC     #BIT7,PSW       ;LOWER CPU PRIORITY TO 140
7467 046322  052777  000100  134442        BIS     #BIT6,@$TKS     ;ENABLE KEYBOARD INTERRUPTS
7468 046330  010637  002374                MOV     SP,FSSTACK
7469
7470 046334  000001                        WAIT
7471
7472 046336  013706  002374        CMD7A:  MOV     FSSTACK,SP      ;RECOVER OLD STACK POINTER
7473 046342  042777  000100  134422        BIC     #BIT6,@$TKS
7474 046350                                POP     TKVEC+2,TKVEC
     046350  012637  000062                                                        MOV (SP)+,TKVEC+2
     046354  012637  000060                                                        MOV (SP)+,TKVEC
7475 046360  117700  134410                MOVB    @$TKB,R0        ;GET CHARACTER TO GET RID OF FLAG
```

```
7476 046364                          TYPE    MSG054                  ;NOW STARTING READ TEST OF MEMORY BANKS
     046364  104401  114572          TYPEIT  ,MSG054
                                     .DSABL  CRF
7477 046370                          FOR BANK := #0 TO #167
     046370  005037  002106                                                  CLR BANK
     046374                                                          B64:::::::
7478 046374  004737  042422            CALL  EXBANK
7479 046400                            IF ACFLAG IS TRUE AND RRFLAG IS FALSE
     046400  005737  002124                                                  TST ACFLAG
     046404  001416                                                          BEQ L525
     046406  005737  002132                                                  TST RRFLAG
     046412  001013                                                          BNE L525
7480 046414  104511                      INVALIDATE
7481 046416                              LET R2 := BANK
     046416  013702  002106                                                  MOV BANK,R2
7482 046422  012700  060000              MOV #FIRST,R0
7483 046426  010004                      MOV R0,R4
7484 046430  012701  040000              MOV #SIZE,R1
7485 046434  010103                      MOV R1,R3
7486 046436  004737  026220              CALL        SUPD03
7487 046442                            END ;OF IF ACFLAG
     046442                                                          L525:::::::
7488 046442                          END ;OF FOR BANK
     046442  005237  002106                                                  INC BANK
     046446  023727  002106  000167                                          CMP BANK,#167
     046454  003747                                                          BLE B64
     046456                                                          E64:::::::::
7489 046456                          TYPE    MSG047                  ;TEST COMPLETE
     046456  104401  114264          TYPEIT  ,MSG047
                                     .DSABL  CRF
7490 046462  005037  002546          CLR     FS7FLAG
7491 046466                          POP     CSRNO,MARGIN,PATTERN,BANK
     046466  012637  002256                                                  MOV (SP)+,CSRNO
     046472  012637  002112                                                  MOV (SP)+,MARGIN
     046476  012637  002120                                                  MOV (SP)+,PATTERN
     046502  012637  002106                                                  MOV (SP)+,BANK
7492 046506  000207                  RETURN
7493
```

```
7496 046510                            FSCMD8: SUBTST  <<FS     COMMAND 8       SOB-A-LONG TEST>>
                                       ;*****************************************************************
                                       ;*SUBTEST       FS       COMMAND 8       SOB-A-LONG TEST
                                       ;*****************************************************************
7497 046510                                    PUSH    BANK,PATTERN,MARGIN,TKVEC,TKVEC+2,NOPAR
     046510  013746  002106                                                          MOV BANK,-(SP)
     046514  013746  002120                                                          MOV PATTERN,-(SP)
     046520  013746  002112                                                          MOV MARGIN,-(SP)
     046524  013746  000060                                                          MOV TKVEC,-(SP)
     046530  013746  000062                                                          MOV TKVEC+2,-(SP)
     046534  013746  002100                                                          MOV NOPAR,-(SP)
7498 046540  010637  002374                    MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK POINTER
7499 046544                                    TYPE    MSG055                  ;SOB-A-LONG TEST
     046544  104401  114642                    TYPEIT  ,MSG055
                                               .DSABL  CRF
7500 046550                            CMD8A:  TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
     046550  104401  114150                    TYPEIT  ,MSG044
                                               .DSABL  CRF
7501 046554  104413                            RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
7502 046556                                    POP     MARGIN                  ;PUT IN IN MARGIN
     046556  012637  002112                                                          MOV (SP)+,MARGIN
7503 046562                                    IF MARGIN GT #5 OR MARGIN EQ #1
     046562  023727  002112  000005                                                  CMP MARGIN,#5
     046570  003004                                                                  BGT L526
     046572  023727  002112  000001                                                  CMP MARGIN,#1
     046600  001001                                                                  BNE L527
     046602                                                                 L526:;;;;;;;
7504 046602                                      GOTO CMD8A
     046602  000762                                                                  BR CMD8A
7505 046604                                    END ;OF IF
     046604                                                                 L527:;;;;;;;
7506 046604                                    IF MARGIN NE #0 AND #SW11 SET.IN @SWR
     046604  005737  002112                                                          TST MARGIN
     046610  001407                                                                  BEQ L530
     046612  032777  004000  134146                                                  BIT #SW11,@SWR
     046620  001403                                                                  BEQ L530
7507 046622                                      TYPE  MSG045                  ;MARGINS INHIBITED BY SW11
     046622  104401  114175                    TYPEIT  ,MSG045
                                               .DSABL  CRF
7508 046626                                      GOTO CMD8A
     046626  000750                                                                  BR CMD8A
7509 046630                                    END ;OF IF MARGIN
     046630                                                                 L530:;;;;;;;
7510
7511 046630                                    IF #SW0 SET.IN @SWR
     046630  032777  000001  134130                                                  BIT #SW0,@SWR
     046636  001402                                                                  BEQ L531
7512 046640  104470                              ECCDIS                        ;DISABLE ERROR CORRECTION
7513 046642                                    ELSE
     046642  000401                                                                  BR L532
     046644                                                                 L531:;;;;;;;
7514 046644  104502                              CLRCSR                        ;CLEAR MK11 CSRS
7515 046646                                    END ;OF IF
     046646                                                                 L532:;;;;;;;
7516 046646                                    TYPE    MSG056                  ;BELL - EACH PASS COMPLETE
     046646  104401  114663                    TYPEIT  ,MSG056
                                               .DSABL  CRF
```

```
7517
7518 046652                                    TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY
     046652 104401 114231                      TYPEIT  ,MSG046
                                               .DSABL  CRF
7519 046656 012737 047014 000060               MOV     #CMD8C,TKVEC
7520 046664 012737 000340 000062               MOV     #340,TKVEC+2
7521 046672 017700 134076                      MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
7522 046676 042737 000200 177776               BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
7523 046704 052777 000100 134060               BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
7524
7525 046712 013700 002112                      MOV     MARGIN,R0               ;SET MARGINS
7526 046716 006300                             ASL     R0                      ;SET MARGINS
7527 046720 010037 177750                      MOV     R0,MAINT
7528
7529 046724                                    SET     HEADER,MUT                                      MOV  #-1,HEADER
     046724 012737 177777 002724                                                                       MOV  #-1,MAIT
     046732 012737 177777 002116
7530
7531 046740                            CMD8B:  FOR BANK := #0 TO #167                                  CLR BANK
     046740 005037 002106                                                                        B65:::::::
     046744
7532 046744 004737 042422                        CALL EXBANK
7533 046750                                      IF ACFLAG IS TRUE AND RRFLAG IS FALSE                  TST ACFLAG
     046750 005737 002124                                                                              BEQ L533
     046754 001406                                                                                     TST RRFLAG
     046756 005737 002132                                                                              BNE L533
     046762 001003
7534 046764 104511                                 INVALIDATE
7535 046766 004737 025214                          CALL MT0031
7536 046772                                      END ;OF IF ACFLAG
     046772                                                                                      L533:::::::
7537 046772                                    END ;OF FOR BANK                                        INC BANK
     046772 005237 002106                                                                              CMP BANK,#167
     046776 023727 002106 000167                                                                       BLE B65
     047004 003757                                                                               E65:::::::::
     047006
7538 047006                                    TYPE    $BELL                   ;RING BELL
     047006 104401 003003                      TYPEIT  ,$BELL
                                               .DSABL  CRF
                                               GOTO    CMD8B                                           BR CMD8B
7539 047012
     047012 000752
7540
7541 047014 013706 002374              CMD8C:  MOV     FSSTACK,SP              ;RECOVER OLD STACK POINTER
7542 047020 042777 000100 133744               BIC     #BIT6,@$TKS
7543 047026 117700 133742                      MOVB    @$TKB,R0                ;READ CHAR TO KILL FLAG
7544 047032                                    POP     NOPAR,TKVEC+2,TKVEC,MARGIN,PATTERN,BANK
     047032 012637 002100                                                                              MOV (SP)+,NOPAR
     047036 012637 000062                                                                              MOV (SP)+,TKVEC+2
     047042 012637 000060                                                                              MOV (SP)+,TKVEC
     047046 012637 002112                                                                              MOV (SP)+,MARGIN
     047052 012637 002120                                                                              MOV (SP)+,PATTERN
     047056 012637 002106                                                                              MOV (SP)+,BANK
7545 047062                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
     047062 010346                                                                                     MOV R3,-(SP)
     047064 013703 002106                      MOV     BANK,R3
     047070 004737 040700                      CALL    MAPPER
                                               .DSABL  CRF
```

```
        COMMAND 8       SOB-A-LONG TEST

        047074  012603                                          MOV (SP)+,R3
 7546   047076  004737  042422          CALL    EXBANK
 7547   047102  000207                  RETURN
```

```
 7550 047104                            FSCMD9: SUBTST  <<FS    COMMAND 9       SUPER TIGHT SCOPE LOOP>>
                                        ;*********************************************************************
                                        ;*SUBTEST       FS      COMMAND 9       SUPER TIGHT SCOPE LOOP
                                        ;*********************************************************************
 7551 047104                                    PUSH    BANK,MARGIN,TKVEC,TKVEC+2,NOPAR
      047104  013746  002106                                                          MOV BANK,-(SP)
      047110  013746  002112                                                          MOV MARGIN,-(SP)
      047114  013746  000060                                                          MOV TKVEC,-(SP)
      047120  013746  000062                                                          MOV TKVEC+2,-(SP)
      047124  013746  002100                                                          MOV NOPAR,-(SP)
 7552 047130  010637  002374                    MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK
 7553 047134                                    TYPE    MSG059                  ;SUPER TIGHT SCOPE LOOP
      047134  104401  114766                    TYPEIT  ,MSG059
                                                .DSABL  CRF
 7554 047140                                    IF #SW0 SET.IN @SWR
      047140  032777  000001  133620                                                  BIT #SW0,@SWR
      047146  001402                                                                  BEQ L534
 7555 047150  104470                              ECCDIS                        ;DISABLE ERROR CORRECTION
 7556 047152                                    ELSE
      047152  000401                                                                 BR L535
      047154                                                                L534:;;;;;;;
 7557 047154  104502                              CLRCSR                        ;CLEAR MK11 CSRS
 7558 047156                                    END ;OF IF
      047156                                                                L535:;;;;;;;
 7559 047156                            1$:     TYPE    MSG031          ;PHYSICAL ADDRESS (0-16777776)??
      047156  104401  113473                    TYPEIT  ,MSG031
                                                .DSABL  CRF
 7560 047162  104413                            RDOCT                   ;READ OCTAL NUMBER ONTO STACK & $HIOCT
 7561 047164  013737  074434  002106            MOV     $HIOCT,BANK     ;PUT MSB'S IN BANK
 7562 047172                                    POP     R0              ;PUT LSB'S IN R0
      047172  012600                                                                  MOV (SP)+,R0
 7563 047174  000241                            CLC
 7564 047176  006100                            ROL     R0
 7565 047200  006137  002106                    ROL     BANK
 7566 047204  000241                            CLC
 7567 047206  006000                            ROR     R0
 7568 047210                                    IF BANK GT #167 THEN GOTO 1$    ;CHECK FOR BANK TOO HIGH
      047210  023727  002106  000167                                                  CMP BANK,#167
      047216  003357                                                                  BGT 1$
 7569 047220  062700  060000                    ADD     #FIRST,R0
 7570 047224                                    IF #BIT0 SET.IN R0 THEN GOTO 1$ ;CHECK FOR ODD ADDRESS
      047224  032700  000001                                                          BIT #BIT0,R0
      047230  001352                                                                 BNE 1$
 7571 047232                                    IF R0 HI #LAST THEN GOTO 1$     ;CHECK FOR ADDRESS OVER 16K
      047232  020027  157776                                                          CMP R0,#LAST
      047236  101347                                                                 BHI 1$
 7572
 7573 047240                            CMD9A:  TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
      047240  104401  114150                    TYPEIT  ,MSG044
                                                .DSABL  CRF
 7574 047244  104413                            RDOCT                   ;READ AN OCTAL NUMBER ONTO THE STACK
 7575 047246                                    POP     MARGIN          ;PUT IN IN MARGIN
      047246  012637  002112                                                          MOV (SP)+,MARGIN
 7576 047252                                    IF MARGIN GT #5 OR MARGIN EQ #1
      047252  023727  002112  000005                                                  CMP MARGIN,#5
      047260  003004                                                                  BGT L536
      047262  023727  002112  000001                                                  CMP MARGIN,#1
```

```
                047270  001001                                                          BNE L537
                047272                                                          L536:::::::
7577            047272                          GOTO CMD9A
                047272  000762                                                          BR CMD9A
7578            047274                          END ;OF IF
                047274                                                          L537:::::::
7579            047274                          IF MARGIN NE #0 AND #SW11 SET.IN @SWR
                047274  005737  002112                                                  TST MARGIN
                047300  001407                                                          BEQ L540
                047302  032777  004000  133456                                        BIT #SW11,@SWR
                047310  001403                                                          BEQ L540
7580            047312                            TYPE  MSG045              ;MARGINS INHIBITED BY SW11
                047312  104401  114175           TYPEIT  ,MSG045
                                                 .DSABL  CRF
7581            047316                            GOTO CMD9A
                047316  000750                                                          BR CMD9A
7582            047320                          END ;OF IF MARGIN
                047320                                                          L540:::::::
7583
7584            047320  012737  000003  002100   MOV     #3,NOPAR                  ;PARITY ACTION
7585            047326  012737  047444  002372   MOV     #CMD9LOOP,PARTHERE
7586            047334                           SET4    #CMD9B           ;TRAPS TO 4 GOTO CMD9B
                047334  012737  047456  000004   MOV     #CMD9B,4
                                                 .DSABL  CRF
7587            047342                           MAP     BANK                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
                047342  010346                                                          MOV R3,-(SP)
                047344  013703  002106           MOV     BANK,R3
                047350  004737  040700           CALL    MAPPER
                                                 .DSABL  CRF
                047354  012603                                                          MOV (SP)+,R3
7588            047356  104511                   INVALIDATE
7589            047360                           TYPE    MSG060                    ;SWR ---> MEM, MEM ---> DISPLAY
                047360  104401  115016           TYPEIT  ,MSG060
                                                 .DSABL  CRF
7590
7591            047364                           TYPE    MSG046                    ;TO ESCAPE TYPE ANY KEY.
                047364  104401  114231           TYPEIT  ,MSG046
                                                 .DSABL  CRF
7592            047370  012737  047464  000060   MOV     #CMD9C,TKVEC
7593            047376  012737  000340  000062   MOV     #340,TKVEC+2
7594            047404  017701  133364           MOV     @$TKB,R1                  ;KILL ANY OLD INTERRUPT
7595            047410  042737  000200  177776   BIC     #BIT7,PSW                 ;LOWER CPU PRIORITY TO 140
7596            047416  052777  000100  133346   BIS     #BIT6,@$TKS               ;ENABLE KEYBOARD INTERRUPTS
7597
7598            047424  013701  002112           MOV     MARGIN,R1                 ;SET MARGINS
7599            047430  006301                   ASL     R1                        ;SET MARGINS
7600            047432  010137  177750           MOV     R1,MAINT
7601
7602            047436                           SUPERVISOR               ;ENTER SUPERVISOR MODE
                047436  052737  040000  177776   BIS     #BIT14,PSW                ;DO IT TO IT!
                                                 .DSABL  CRF
7603            047444  017710  133316  CMD9LOOP:MOV     @SWR,(R0)                 ;WRITE SWITCH REGISTER INTO MEMORY
7604            047450  011077  133314           MOV     (R0),@DISPLAY             ;READ MEMORY INTO DISPLAY REGISTER
7605            047454  000773                   BR      CMD9LOOP                  ;LOOP TILL KEYBOARD INTERRUPT
7606
7607            047456  012716  047444  CMD9B:   MOV     #CMD9LOOP,(SP)
7608            047462  000002                   RTI
```

```
                        COMMAND 9       SUPER TIGHT SCOPE LOOP

 7609
 7610 047464  013706  002374          CMD9C:  MOV     FSSTACK,SP                      ;RECOVER OLD STACK POINTER
 7611 047470  042777  000100  133274          BIC     #BIT6,@$TKS
 7612 047476  117700  133272                  MOVB    @$TKB,R0                        ;READ CHAR TO KILL FLAG
 7613 047502                                  POP     NOPAR,TKVEC+2,TKVEC,MARGIN,BANK
      047502  012637  002100                                                          MOV (SP)+,NOPAR
      047506  012637  000062                                                          MOV (SP)+,TKVEC+2
      047512  012637  000060                                                          MOV (SP)+,TKVEC
      047516  012637  002112                                                          MOV (SP)+,MARGIN
      047522  012637  002106                                                          MOV (SP)+,BANK
 7614 047526                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
      047526  010346                                                          MOV R3,-(SP)
      047530  013703  002106                  MOV     BANK,R3
      047534  004737  040700                  CALL    MAPPER
                                               .DSABL  CRF
      047540  012603                                                          MOV (SP)+,R3
 7615 047542  004737  042422                  CALL    EXBANK
 7616 047546  000207                          RETURN
 7617
 7618 047550                          FCMD10: SUBTST  <<FS    COMMAND 10      ERROR SUMMARY>>
                                      ;*****************************************************************************
                                      ;*SUBTEST        FS      COMMAND 10      ERROR SUMMARY
                                      ;*****************************************************************************
 7619 047550                                  PUSH    R0,R2,R3,BANK
      047550  010046                                                          MOV R0,-(SP)
      047552  010246                                                          MOV R2,-(SP)
      047554  010346                                                          MOV R3,-(SP)
      047556  013746  002106                                                  MOV BANK,-(SP)
 7620 047562                                  TYPDEC  $ERTTL
      047562  013746  002754                  MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
      047566  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                               .DSABL  CRF
 7621 047570                                  TYPE    MSG079                  ;ERROR(S) DETECTED
      047570  104401  115474                  TYPEIT  ,MSG079
                                               .DSABL  CRF
 7622 047574                                  IF $ERTTL NE #0
      047574  005737  002754                                                  TST $ERTTL
      047600  001447                                                          BEQ L541
 7623 047602  005037  002424                    CLR   SUCCESS
 7624 047606                                    FOR BANK := #0 TO #167
      047606  005037  002106                                                  CLR BANK
      047612                                                          B66:;;;;;;
 7625 047612  013703  002106                      MOV BANK,R3
 7626 047616  070327  000006                      MUL #6,R3
 7627 047622  062703  000005                      ADD #5,R3
 7628 047626                                      IFB CONFIG(R3) NE #0
      047626  105763  003016                                                  TSTB CONFIG(R3)
      047632  001424                                                          BEQ L542
 7629 047634                                        IF SUCCESS IS FALSE
      047634  005737  002424                                                  TST SUCCESS
      047640  001005                                                          BNE L543
 7630 047642                                          TYPE    MSG076          ;BANK  ERRORS
      047642  104401  115373                  TYPEIT  ,MSG076
                                               .DSABL  CRF
 7631 047646                                          SET SUCCESS
      047646  012737  177777  002424                                          MOV  #-1,SUCCESS
 7632 047654                                        END ;OF IF SUCCESS
```

```
                047654
                047654                                                                  1543::::::
                047654  013746  002106                  TYPOCS  BANK,3
                                                MOV     BANK,-(SP)      ;;SAVE BANK FOR TYPEOUT
                                                                        ;;3
                047660  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
                047662     006                  .BYTE   6               ;;TYPE 6 DIGITS
                047663     000                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                .DSABL  CRr
                047664  116300  003016          MOVB    CONFIG(R3),R0
                047670  042700  177400          BIC     #^C377,R0
                047674                          TYPDEC  R0
                047674  010046                  MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                047676  104405                  TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                                .DSABL  CRF
                047700                          TYPE    $CRLF
                047700  104401  003010          TYPEIT  ,$CRLF
                                                .DSABL  CRF
                047704                          END ;OF IFB CONFIG(R3)
                047704                                                                  L542::::::
                047704
                047704  005237  002106                                                          INC BANK
                047710  023727  002106  000167                                                  CMP BANK,#167
                047716  003735                                                                  BLE B66
                047720                                                                  E66:::::::
                047720                  END ;OF IF $ERTTL
                047720                                                                  L541::::::
                047720                  POP     BANK,R3,R2,R0
                047720  012637  002106                                                          MOV (SP)+,BANK
                047724  012603                                                                  MOV (SP)+,R3
                047726  012602                                                                  MOV (SP)+,R2
                047730  012600                                                                  MOV (SP)+,R0
                047732  000207                  RETURN
```

```
7645 047734                                FCMD11: SUBTST  <<FS     COMMAND 11      REFRESH TEST>>
                                           ;*****************************************************************
                                           ;*SUBTEST        FS      COMMAND 11      REFRESH TEST
                                           ;*****************************************************************
7646 047734                                        PUSH    BANK,PATTERN,MARGIN,TKVEC,TKVEC+2,NOPAR
     047734 013746 002106                                                                           MOV BANK,-(SP)
     047740 013746 002120                                                                           MOV PATTERN,-(SP)
     047744 013746 002112                                                                           MOV MARGIN,-(SP)
     047750 013746 000060                                                                           MOV TKVEC,-(SP)
     047754 013746 000062                                                                           MOV TKVEC+2,-(SP)
     047760 013746 002100                                                                           MOV NOPAR,-(SP)
7647 047764 010637 002374                          MOV     SP,FSSTACK              ;SAVE LAST GOOD STACK POINTER
7648 047770                                        TYPE    MSG073                  ;REFRESH TEST
     047770 104401 115317                          TYPEIT  ,MSG073
                                                   .DSABL  CRF
7649 047774                                CMD11A: TYPE    MSG044                  ;MARGIN(0,2,3,4,5)?
     047774 104401 114150                          TYPEIT  ,MSG044
                                                   .DSABL  CRF
7650 050000 104413                                 RDOCT                           ;READ AN OCTAL NUMBER ONTO THE STACK
7651 050002                                        POP     MARGIN                  ;PUT IN IN MARGIN
     050002 012637 002112                                                                           MOV (SP)+,MARGIN
7652 050006                                        IF MARGIN GT #5 OR MARGIN EQ #1
     050006 023727 002112 000005                                                                    CMP MARGIN,#5
     050014 003004                                                                                  BGT L544
     050016 023727 002112 000001                                                                    CMP MARGIN,#1
     050024 001001                                                                                  BNE L545
     050026                                                                                   L544:;;;;;;
7653 050026                                          GOTO CMD11A
     050026 000762                                                                                  BR CMD11A
7654 050030                                        END ;OF IF
     050030                                                                                   L545:;;;;;;
7655 050030                                        IF MARGIN NE #0 AND #SW11 SET.IN @SWR
     050030 005737 002112                                                                           TST MARGIN
     050034 001407                                                                                  BEQ L546
     050036 032777 004000 132722                                                                    BIT #SW11,@SWR
     050044 001403                                                                                  BEQ L546
7656 050046                                          TYPE  MSG045                  ;MARGINS INHIBITED BY SW11
     050046 104401 114175                          TYPEIT  ,MSG045
                                                   .DSABL  CRF
7657 050052                                          GOTO CMD11A
     050052 000750                                                                                  BR CMD11A
7658 050054                                        END ;OF IF MARGIN
     050054                                                                                   L546:;;;;;;
7659
7660 050054                                        IF #SW0 SET.IN @SWR
     050054 032777 000001 132704                                                                    BIT #SW0,@SWR
     050062 001402                                                                                  BEQ L547
7661 050064 104470                                   ECCDIS                        ;DISABLE ERROR CORRECTION
7662 050066                                        ELSE
     050066 000401                                                                                  BR L550
     050070                                                                                   L547:;;;;;;
7663 050070 104502                                   CLRCSR                        ;CLEAR MK11 CSRS
7664 050072                                        END ;OF IF
     050072                                                                                   L550:;;;;;;
7665 050072                                        TYPE    MSG056                  ;BELL - EACH PASS COMPLETE
     050072 104401 114663                          TYPEIT  ,MSG056
                                                   .DSABL  CRF
```

```
7666
7667 050076                                    TYPE    MSG046                  ;TO ESCAPE TYPE ANY KEY.
     050076  104401  114231                    TYPEIT  ,MSG046
                                               .DSABL  CRF
7668 050102  012737  050240  000060            MOV     #CMD11C,TKVEC
7669 050110  012737  000340  000062            MOV     #340,TKVEC+2
7670 050116  017700  132652                    MOV     @$TKB,R0                ;KILL ANY OLD INTERRUPT
7671 050122  042737  000200  177776            BIC     #BIT7,PSW               ;LOWER CPU PRIORITY TO 140
7672 050130  052777  000100  132634            BIS     #BIT6,@$TKS             ;ENABLE KEYBOARD INTERRUPTS
7673
7674 050136  013700  002112                    MOV     MARGIN,R0               ;SET MARGINS
7675 050142  006300                            ASL     R0                      ;SET MARGINS
7676 050144  010037  177750                    MOV     R0,MAINT
7677
7678 050150                                    SET     HEADER,MUT
     050150  012737  177777  002724                                                    MOV  #-1,HEADFR
     050156  012737  177777  002116                                                    MOV  #-1,MUT
7679
7680 050164                            CMD11B: FOR BANK := #0 TO #167
     050164  005037  002106                                                            CLR BANK
     050170                                                                    B67:::::::
7681 050170  004737  042422                      CALL EXBANK
7682 050174                                      IF ACFLAG IS TRUE AND RRFLAG IS FALSE
     050174  005737  002124                                                            TST ACFLAG
     050200  001406                                                                    BEQ L551
     050202  005737  002132                                                            TST RRFLAG
     050206  001003                                                                    BNE L551
7683 050210  104511                                INVALIDATE
7684 050212  004737  023734                        CALL MT0022
7685 050216                                      END ;OF IF ACFLAG
     050216                                                                    L551:::::::
7686 050216                                    END ;OF FOR BANK
     050216  005237  002106                                                            INC BANK
     050222  023727  002106  000167                                                    CMP BANK,#167
     050230  003757                                                                    BLE B67
     050232                                                                    E67:::::::::
7687 050232                                    TYPE    $BELL                   ;RING BELL
     050232  104401  003003                    TYPEIT  ,$BELL
                                               .DSABL  CRF
7688 050236                                    GOTO    CMD11B
     050236  000752                                                                    BR CMD11B
7689
7690 050240  013706  002374            CMD11C: MOV     FSSTACK,SP                      ;RECOVER OLD STACK POINTER
7691 050244  042777  000100  132520            BIC     #BIT6,@$TKS
7692 050252  117700  132516                    MOVB    @$TKB,R0                        ;READ CHAR TO KILL FLAG
7693 050256                                    POP     NOPAR,TKVEC+2,TKVEC,MARGIN,PATTERN,BANK
     050256  012637  002100                                                            MOV (SP)+,NOPAR
     050262  012637  000062                                                            MOV (SP)+,TKVEC+2
     050266  012637  000060                                                            MOV (SP)+,TKVEC
     050272  012637  002112                                                            MOV (SP)+,MARGIN
     050276  012637  002120                                                            MOV (SP)+,PATTERN
     050302  012637  002106                                                            MOV (SP)+,BANK
7694 050306                                    MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
     050306  010346                                                                    MOV R3,-(SP)
     050310  013703  002106                    MOV     BANK,R3
     050314  004737  040700                    CALL    MAPPER
                                               .DSABL  CRF
```

```
                050320  012603                                          MOV (SP)+,R3
 7695           050322  004737  042422          CALL    EXBANK
 7696           050326  000207                  RETURN
 7697
```

```
                                FCMD12: SUBTST  <<FS    COMMAND 12      SET FILL COUNT>>
                                ;*******************************************************************************
                                ;*SUBTEST        FS      COMMAND 12      SET FILL COUNT
                                ;*******************************************************************************
                                        PUSH    R0                                                      MOV R0,-(SP)
                                        TYPE    MSG085          ;FILL COUNT(OCTAL)?
                                        TYPEIT  ,MSG085
                                        .DSABL  CRF
                                        RDOCT
                                        POP     R0                                                      MOV (SP)+,R0
                                        BIC     #^C17,R0
                                        MOVB    R0,$FILLS
                                        POP     R0                                                      MOV (SP)+,R0
                                        RETURN

                                FCMD13: SUBTST  <<FS    COMMAND 13      ENTER KAMIKAZE MODE>>
                                ;*******************************************************************************
                                ;*SUBTEST        FS      COMMAND 13      ENTER KAMIKAZE MODE
                                ;*******************************************************************************
                                        TYPE    MSG101          ;ENTERING KAMIKAZE MODE
                                        TYPEIT  ,MSG101
                                        .DSABL  CRF
                                        SET     KAMIKAZE,SKIPKAMI
                                                                                                        MOV  #-1,KAMIKAZE
                                                                                                        MOV  #-1,SKIPKAMI
                                        RETURN

                                FCMD14: SUBTST  <<FS    COMMAND 14      EXIT KAMIKAZE MODE>>
                                ;*******************************************************************************
                                ;*SUBTEST        FS      COMMAND 14      EXIT KAMIKAZE MODE
                                ;*******************************************************************************
                                        TYPE    MSG102          ;LEAVING KAMIKAZE MODE
                                        TYPEIT  ,MSG102
                                        .DSABL  CRF
                                        CLR     KAMIKAZE
                                        SET     SKIPKAMI
                                                                                                        MOV  #-1,SKIPKAMI
                                        RETURN

                                FCMD15: SUBTST  <<FS    COMMAND 15      TURN CACHE OFF>>
                                ;*******************************************************************************
                                ;*SUBTEST        FS      COMMAND 15      TURN CACHE OFF
                                ;*******************************************************************************
                                        TYPE    MSG106                          ;CACHE IS OFF
                                        TYPEIT  ,MSG106
                                        .DSABL  CRF
                                        MOV     #BIT0!BIT2.BIT3!BIT8!BIT9,CACHK
                                        CACHOFF                 ;TURN CACHE OFF
                                        RETURN

                                FCMD16: SUBTST  <<FS    COMMAND 16      TURN CACHE ON>>
                                ;*******************************************************************************
                                ;*SUBTEST        FS      COMMAND 16      TURN CACHE ON
                                ;*******************************************************************************
```

```
7728 050436                            TYPE    MSG107                  ;CACHE IS ON (EXCEPT DURING ACTUAL PATTERNS)
     050436  104401  116545            TYPEIT  ,MSG107
                                       .DSABL  CRF
7729 050442  012737  000001  002700    MOV     #BIT0,CACHK
7730 050450  104423                    CACHON                  ;TURN CACHE ON
7731 050452  000207                    RETURN
7732
7733 050454                    FCMD17: SUBTST  <<FS    COMMAND 17      RUN ONLY MULTIPORT TESTS>>
                                       ;*********************************************************************
                                       ;*SUBTEST       FS      COMMAND 17      RUN ONLY MULTIPORT TESTS
                                       ;*********************************************************************
7734 050454                            TYPE    MSG108                  ;ONLY MULTIPORT TESTS WILL BE RUN
     050454  104401  116622            TYPEIT  ,MSG108
                                       .DSABL  CRF
7735 050460                            SET     MULTIONLY
     050460  012737  177777  002004                                                  MOV  #-1,MULTIONLY
7736 050466  000207                    RETURN
```

```
7739 050470                        ;CMD18: SUBTST <<FS    COMMAND 18      RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS>>
                                   ;*****************************************************************************
                                   ;*SUBTEST       FS      COMMAND 18      RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS
                                   ;*****************************************************************************
7740 050470                                TYPE    MSG109                  ;BOTH SINGLE & MULTIPORT TESTS WILL BE RUN
     050470  104401  116664               TYPEIT  ,MSG109
                                         .DSABL  CRF
7741 050474  005037  002004               CLR     MULTIONLY
7742 050500  000207                       RETURN
7743
7744 050502                        ;CMD19: SUBTST <<FS    COMMAND 19      TEST ONLY SELECTED BANKS>>
                                   ;*****************************************************************************
                                   ;*SUBTEST       FS      COMMAND 19      TEST ONLY SELECTED BANKS
                                   ;*****************************************************************************
7745 050502                                TYPE    MSG105          ;ENTER BANKS IN OCTAL - USE NUMBER OUTSIDE RANGE TO TERMINAT
     050502  104401  116423               TYPEIT  ,MSG105
                                         .DSABL  CRF
7746 050506  004737  050576               CALL    CMD20A          ;ERASE OLD SELECTIONS
7747 050512                                BEGIN CMD19LOOP
     050512                                                                  B70:;;;;;;
7748 050512                                  REPEAT
     050512                                                                  B71:;;;;;;
7749 050512                                    TYPE        MSG030          ;BANK(0-167)?
     050512  104401  113454               TYPEIT  ,MSG030
                                         .DSABL  CRF
7750 050516  104413                           RDOCT                       ;READ AN OCTAL NUMBER ONTO THE STACK
7751 050520                                    POP R1              ;PUT IT IN R1
     050520  012601                                                             MOV (SP)+,R1
7752 050522                                    IF R1 GT #167 OR R1 LT #0
     050522  020127  000167                                                     CMP R1,#167
     050526  003002                                                             BGT L552
     050530  005701                                                             TST R1
     050532  002001                                                             BGE L553
     050534                                                                 L552:;;;;;;
7753 050534                                      LEAVE CMD19LOOP
     050534  000406                                                             BR E70
7754 050536                                    END ;OF IF R1
     050536                                                                 L553:;;;;;;
7755 050536  070127  000006                    MUL #6,R1
7756 050542  052761  040000  003020            BIS #BIT14,CONFIG+2(R1)
7757 050550                                  END ;OF REPEAT
     050550  000760                                                             BR B71
     050552                                                                 E71:;;;;;;
7758 050552                                END CMD20LOOP
     050552                                                                 E70:;;;;;;
7759 050552                                TYPE    MSG110          ;ONLY SELECTED BANKS WILL BE TESTED
     050552  104401  116737               TYPEIT  ,MSG110
                                         .DSABL  CRF
7760 050556                                SET     SELONLY
     050556  012737  177777  002002                                             MOV  #-1,SELONLY
7761 050564  000207                       RETURN
7762
7763 050566                        ;CMD20: SUBTST <<FS    COMMAND 20      RESUME TESTING ALL BANKS>>
                                   ;*****************************************************************************
                                   ;*SUBTEST       FS      COMMAND 20      RESUME TESTING ALL BANKS
                                   ;*****************************************************************************
7764 050566                                TYPE    MSG111                  ;ALL BANKS WILL BE TESTED
```

```
        050566  104401  117003                  TYPEIT  ,MSG111
                                                 .DSABL  CRF
 7765   050572  005037  002002                  CLR     SELONLY
 7766
 7767                                            ;ENTRY POINT FROM CMD19
 7768   050576                          CMD20A: FOR R1 :- #0 TO #167*3*2 BY #6
        050576  005001                                                          CLR R1
        050600                                                          B72:::::::
 7769   050600  042761  040000  003020            BIC   #BIT14,CONFIG+2(R1)    ;DESELECT BANK
 7770   050606  042761  020000  003020            BIC   #BIT13,CONFIG+2(R1)    ;INVALIDATE BACKGROUND PATTERN
 7771   050614                                    END ;OF FOR R1
        050614  062701  000006                                                  ADD #6,R1
        050620  020127  001312                                                  CMP R1,#167*3*2
        050624  003765                                                          BLE B72
        050626                                                          E72:::::::
 7772   050626  000207                          RETURN
```

```
 7775 050630                        WHICHCSR:SUBTST <<SUBR  DETERMINE CORRECT CSR>>
                                    ;*****************************************************************
                                    ;*SUBTEST        SUBR    DETERMINE CORRECT CSR
                                    ;*****************************************************************
 7776 050630  013700  002334               MOV     MKCSRS,R0       ;GET CSR'S FLAG
 7777 050634  122700  000200               CMPB    #BIT7,R0        ;CSR 0?
 7778 050640  001003                       BNE     1$              ;NO - SKIP
 7779 050642  005037  002256               CLR     CSRNO           ;YES - SET IT UP
 7780 050646  000207                       RETURN
 7781
 7782 050650                        1$:    TYPE    MSG022          ;WHICH CSR(0-7)
      050650  104401  113252               TYPEIT  ,MSG022
                                           .DSABL  CRF
 7783 050654  104413                       RDOCT                   ;GET OCTAL NUMBER
 7784 050656                               POP     R0              ;PUT IN R0
      050656  012600                                                                MOV (SP)+,R0
 7785 050660  020027  000007               CMP     R0,#7           ;CHECK LIMIT
 7786 050664  101371                       BHI     1$              ;IF BAD LOOP TILL HE TYPES IT RIGHT
 7787 050666  012701  177774               MOV     #-4,R1
 7788 050672  005200                       INC     R0
 7789 050674  062701  000004        2$:    ADD     #4,R1
 7790 050700  077003                       SOB     R0,2$
 7791 050702  010137  002256               MOV     R1,CSRNO
 7792 050706  000207                       RETURN
 7793
```

```
                                .TITLE  CEMKABO 1170 MAIN MEMORY DIAG 2
                                .IDENT  /X01.60/
                                .SBTTL  MULTIPROCESSOR SLAVE DISPATCHER
050710                  TASKRET:IF #MASTER NE CPUBIT
050710  022737  000020  002114                                                  CMP #MASTER,CPUBIT
050716  001402                                                                  BEQ L554
050720  000402                    BR    TASKDO
                                ELSE
050722  000401                                                                  BR L555
050724                                                                  L554:::::::
050724  000207                    RETURN
                                END; OF IF #MASTER
050726                                                                  L555:::::::

050726  104424          TASKDO: CACHOFF                 ;TURN CACHE OFF
050730                          MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
050730  010346                                                                  MOV R3,-(SP)
050732  012703  000000          MOV     #0,R3
050736  004737  040700          CALL    MAPPER
                                .DSABL  CRF
050742  012603                                                                  MOV (SP)+,R3
                                SET     R0
050744  012700  177777                                                          MOV  #-1,R0
                                FOR R1 :  #0 TO #6 BY #2
050750  005001                                                                  CLR R1
050752                                                                  B73:::::::
                                  IF R0 EQ ONES
050752  020037  002726                                                          CMP R0,ONES
050756  001024                                                                  BNE L556
                                    IF NOIIST IS TRUE
050760  005737  002756                                                          TST NOIIST
050764  001403                                                                  BEQ L557
                                      MOV       SYSTID,R2
                                    ELSE
050772  000406                                                                  BR L560
050774                                                                  L557:::::::
                                      MOV       @IIS1ACR,R2
                                      ASH       #-8.,R2
                                      BIC       #^C3,R2
                                    END ;OF IF NOIIST
050774                                                                  L560:::::::
                                    SUPERVISOR          ;ENTER SUPERVISOR MODE
051010  052737  040000  177776      BIS     #BIT14,PSW              ;DO IT TO IT!
                                    .DSABL  CRF
                                    IF FIRST+PORTDIR(R1) EQ R2 THEN LET R0 := R1
051016  026102  062606                                                          CMP FIRST+PORTDIR(R1),R2
051022  001001                                                                  BNE L561
051024  010100                                                                  MOV R1,R0
051026                                                                  L561:::::::
                                    KERNEL                          ;ENTER KERNEL MODE
                                  END ;OF IF R0
051030                                                                  L556:::::::

                                END ;OF FOR R1
051030  062701  000002                                                          ADD #2,R1
051034  020127  000006                                                          CMP R1,#6
051040  003744                                                                  BLE B73
051042                                                                  E73:::::::
```

```
     27 051042                                  IF R0 EQ ONES
        051042  020037  002726                                                    CMP R0,ONES
        051046  001003                                                           BNE L562
     28 051050                                    FATAL 41
        051050  005237  002070                  INC     FATAL$                  ;SET FATAL INDICATOR
        051054  104041                          ERROR   +41
                                                 .DSABL  CRF
     29 051056                                  END ;OF IF R0
        051056                                                                  L562:::::::
     30 051056                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
        051056  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT!
                                                 .DSABL  CRF
     31 051064  005760  062616          1$:     TST     FIRST+TASK(R0)          ;WAIT FOR COMMAND
     32 051070  003775                          BLE     1$
     33 051072  013737  062676  002676          MOV     FIRST+MDISPLAY,MDISPLAY
     34 051100  013777  002676  131662          MOV     MDISPLAY,@DISPLAY
     35 051106  116001  062616                  MOVB    FIRST+TASK(R0),R1       ;GET COMMAND
     36 051112  104417                          KERNEL                  ;ENTER KERNEL MODE
     37 051114                                  PUSH    R0
        051114  010046                                                           MOV R0,-(SP)
     38 051116                                  CASE    R1
        051116  010146                                                           MOV R1,-(SP)
        051120  006316                                                           ASL @SP
        051122  004737  051170                                                   JSR PC,L563
     39 051126  051234                            TASK00                  ;0 IS NOT A COMMAND
     40 051130  051236                            TASK01                  ;MOVE PROGRAM TO BANK
     41 051132  051330                            TASK02                  ;WRITE ONLY PATTERN IN HI BYTE
     42 051134  051430                            TASK03                  ;READ ONLY PATTERN IN HI BYTE
     43 051136  051664                            TASK04                  ;EXECUTION CONTENTION TEST
     44 051140  051774                            TASK05                  ;PORT ARBITRATION SYMMETRY TEST
     45 051142  052300                            TASK06                  ;STOP PROGRAM
     46 051144  052326                            TASK07                  ;WRITE ONLY ADDRESS PATTERN
     47 051146  052336                            TASK10                  ;READ ONLY ADDRESS PATTERN
     48 051150  052536                            TASK11                  ;ASYNCHRONOUS ADDRESS UNIQUENESS TEST
     49 051152  052644                            TASK12                  ;SKEWED UP ADDRESS TEST
     50 051154  052726                            TASK13                  ;SETUP FOR ASRB TEST
     51 051156  053276                            TASK14                  ;RESET FROM ASRB TEST
     52 051160  053310                            TASK15                  ;RUN CSR TESTS
     53 051162  053316                            TASK16                  ;SET MARGIN 6, CPU HAS I/O PRIORITY
     54 051164  053334                            TASK17                  ;CREATE STALE DATA TEST
     55 051166  053422                            TASK20                  ;CACHE FLUSH TEST
     56 051170                                  END ;OF CASE R1
        051170                                                                  L563:::::::
        051170  062616                                                                  ADD (SP)+,@SP
        051172  013646                                                                  MOV @(SP)+,-(SP)
        051174  004736                                                                  JSR PC,@(SP)+
     57 051176                                  POP     R0
        051176  012600                                                                  MOV (SP)+,R0
     58 051200                                  MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
        051200  010346                                                                  MOV R3,-(SP)
        051202  012703  000000                  MOV     #0,R3
        051206  004737  040700                  CALL    MAPPER
                                                 .DSABL  CRF
        051212  012603                                                                  MOV (SP)+,R3
     59 051214                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
        051214  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT.
                                                 .DSABL  CRF
```

```
     60 051222  052760  100000  062616          BIS     #BIT15,FIRST+TASK(R0)   ;INDICATE DONE
     61 051230  104417                          KERNEL                          ;ENTER KERNEL MODE
     62 051232  000626                          BR      TASKRET
     63 051234  000207                  TASK00: RETURN
```

```
 66 051236                              TASK01: SUBTST  <<MOVE PROGRAM TO NEW BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MOVE PROGRAM TO NEW BANK
                                        ;*****************************************************************************
 67 051236                                      SUPERVISOR              ;ENTER SUPERVISOR MODE
    051236  052737  040000  177776              BIS     #BIT14,PSW              ;DO IT TO IT
                                                .DSABL  CRF
 68 051244  013700  062106                      MOV     FIRST+BANK,R0
 69 051250  104417                              KERNEL                  ;ENTER KERNEL MODE
 70 051252  004737  041456                      CALL    RELOC1
 71 051256  012737  002000  002706              MOV     #STACK,KSTACK
 72 051264                                      POP     R1,R0                   ;GET OLD RETURN & R0
    051264  012601                                                                      MOV (SP)+,R1
    051266  012600                                                                      MOV (SP)+,R0
 73 051270  013706  002706                      MOV     KSTACK,SP
 74 051274                                      PUSH    R0,R1                   ;PUT BACK R0 & RETURN
    051274  010046                                                                      MOV R0,-(SP)
    051276  010146                                                                      MOV R1,-(SP)
 75 051300                                      MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
    051300  010346                                                                      MOV R3,-(SP)
    051302  012703  000000                      MOV     #0,R3
    051306  004737  040700                      CALL    MAPPEP
                                                .DSABL  CRF
    051312  012603                                                                     MOV (SP)+,R3
 76 051314  005037  002134                      CLR     RLFLAG
 77 051320                                      SET     NOSCOPE                 ;NO SCOPE LOOPS ALLOWED IN MULTIPROCESSOR TESTS .
    051320  012737  177777  002540                                                    MOV  #-1,NOSCOPE
 78 051326  000207                              RETURN
 79
 80 051330                              TASK02: SUBTST  <<WRITE ONLY PATTERN IN HI BYTE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       WRITE ONLY PATTERN IN HI BYTE
                                        ;*****************************************************************************
 81 051330                                      SUPERVISOR              ;ENTER SUPERVISOR MODE
    051330  052737  040000  177776              BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
 82 051336  116005  062617                      MOVB    FIRST+TASK+1(R0),R5
 83 051342  013737  062106  002106              MOV     FIRST+BANK,BANK
 84 051350  104417                              KERNEL                  ;ENTER KERNEL MODE
 85 051352                                      SET     WRITEONLY
    051352  012737  177777  002502                                                    MOV  #-1,WRITEONLY
 86 051360  012700  060000                      MOV     #FIRST,R0
 87 051364  012701  040000                      MOV     #SIZE,R1
 88 051370                                      CASE    R5
    051370  010546                                                                     MOV R5,-(SP)
    051372  006316                                                                     ASL @SP
    051374  004737  051414                                                           JSR PC,L564
 89 051400  051530                                SLPAT0                  ;ZEROS
 90 051402  051534                                SLPAT1                  ;ONES
 91 051404  051542                                SLPAT2                  ;125252
 92 051406  051550                                SLPAT3                  ;52525
 93 051410  051556                                SLPAT4                  ;377
 94 051412  051564                                SLPAT5                  ;177400
 95 051414                                      END ;OF CASE R5
    051414                                                              L564:;;;;;;
    051414  062616                                                             ADD (SP)+,@SP
    051416  013646                                                             MOV @(SP)+,-(SP)
```

```
                051420  004736                                          JSR PC,@(SP)+
     96         051422  005037  002502          CLR     WRITEONLY
     97         051426  000207                  RETURN
```

```
100 051430                          TASK03: SUBTST  <<READ ONLY PATTERN IN HI BYTE>>
                                    ;*************************************************************************
                                    ;*SUBTEST       READ ONLY PATTERN IN HI BYTE
                                    ;*************************************************************************
101 051430                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
    051430  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT
                                            .DSABL  CRF
102 051436  116005  062617                  MOVB    FIRST+TASK+1(R0),R5
103 051442  013737  062106  002106          MOV     FIRST+BANK,BANK
104 051450  104417                          KERNEL                  ;ENTER KERNEL MODE
105 051452                                  SET     READONLY
    051452  012737  177777  002504                                                      MOV  #-1,READONLY
106 051460  012700  060000                  MOV     #FIRST,R0
107 051464  012701  040000                  MOV     #SIZE,R1
108 051470                                  CASE    R5
    051470  010546                                                                     MOV R5,-(SP)
    051472  006316                                                                     ASL @SP
    051474  004737  051514                                                           JSR PC,L565
109 051500  051530                            SLPAT0                ;ZEROS
110 051502  051534                            SLPAT1                ;ONES
111 051504  051542                            SLPAT2                ;125252
112 051506  051550                            SLPAT3                ;52525
113 051510  051556                            SLPAT4                ;377
114 051512  051564                            SLPAT5                ;177400
115 051514                                  END ;OF CASE R5
    051514                                                                  L565:;;;;;;
    051514  062616                                                                     ADD (SP)+,@SP
    051516  013646                                                                     MOV @(SP)+,-(SP)
    051520  004736                                                                     JSR PC,@(SP)+
116 051522  005037  002504                  CLR     READONLY
117 051526  000207                          RETURN
118
119 051530  005002                  SLPAT0: CLR     R2
120 051532  000416                          BR      SLPAT
121 051534                          SLPAT1: SET     R2
    051534  012702  177777                                                          MOV  #-1,R2
122 051540  000413                          BR      SLPAT
123 051542  012702  125252          SLPAT2: MOV     #125252,R2
124 051546  000410                          BR      SLPAT
125 051550  012702  052525          SLPAT3: MOV     #52525,R2
126 051554  000405                          BR      SLPAT
127 051556  012702  000377          SLPAT4: MOV     #377,R2
128 051562  000402                          BR      SLPAT
129 051564  012702  177400          SLPAT5: MOV     #177400,R2
130 051570                          SLPAT:  SUBTST  <<SLAVE PATTERNS>>
                                    ;*************************************************************************
                                    ;*SUBTEST       SLAVE PATTERNS
                                    ;*************************************************************************
131 051570                                  CLEAR   MARGIN,MAINT
    051570  005037  002112                                                          CLR  MARGIN
    051574  005037  177750                                                          CLR  MAINT
132 051600  104502                          CLRCSR                  ;CLEAR MK11 CSRS
133 051602                                  BMOV    MTP000
    051602  004537  043710                      JSR R5,BLOCK1
    051606  026376                              MTP000
                                                .DSABL      CRF
134 051610  012737  000207  177644          MOV     #207,@#PAR2             ;PUT RETURN INST AFTER WRITE ROUTINE
```

SLAVE PATTERNS

```
135 051616  012737  177646  002360          MOV     #U.PAR3,SUPDOADD
136 051624  004737  035204                  CALL    REGCOPY
137 051630  104415                          SAVREG
138 051632                                  IF WRITEONLY IS TRUE THEN $CALL SUPD01
    051632  005737  002502                                              TST WRITEONLY
    051636  001402                                                      BEQ L566
    051640  004737  026042                                              JSR PC,SUPD01
    051644                                                      L566:::::::
139 051644                                  IF READONLY IS TRUE THEN $CALL SUPD03
    051644  005737  002504                                              TST READONLY
    051650  001402                                                      BEQ L567
    051652  004737  026220                                              JSR PC,SUPD03
    051656                                                      L567:::::::
140 051656  104416                          RESREG
141 051660  104424                          CACHOFF                 ;TURN CACHE OFF
142 051662  000207                          RETURN
```

```
                                TASK04: SUBTST  <<EXECUTION CONTENTION TEST>>
                                ;*****************************************************************************
                                ;*SUBTEST        EXECUTION CONTENTION TEST
                                ;*****************************************************************************
                                        SUPERVISOR              ;ENTER SUPERVISOR MODE
051664  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT.
                                        .DSABL  CRF
051672  013737  062106  002106        MOV     FIRST+BANK,BANK
051700  104417                      KERNEL                  ;ENTER KERNEL MODE
051702  005060  002636              CLR     PTYBUF(R0)
051706  012737  000037  002366      MOV     #37,REALPAT
051714  012737  060000  002360      MOV     #FIRST,SUPD0ADD
051722                              PUSH    R0                                              MOV R0,-(SP)
051722  010046
051724  062700  002636              ADD     #PTYBUF,R0              ;R0 = PTYBUF + INDEX FOR CPU
051730  004737  026220              CALL    SUPD03
051734  104424                      CACHOFF                 ;TURN CACHE OFF
051736                              MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
051736  010346                                                                          MOV R3,-(SP)
051740  012703  000000              MOV     #0,R3
051744  004737  040700              CALL    MAPPER
                                        .DSABL  CRF
051750  012603                                                                          MOV (SP)+,R3
051752                              POP     R0
051752  012600                                                                          MOV (SP)+,R0
051754                              SUPERVISOR              ;ENTER SUPERVISOR MODE
051754  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT
                                        .DSABL  CRF
051762  016060  002636  062636      MOV     PTYBUF(R0),FIRST+PTYBUF(R0)
051770  104417                      KERNEL                  ;ENTER KERNEL MODE
051772  000207                      RETURN
```

```
                                        TASK05: SUBTST  <<PORT ARBITRATION SYMMETRY TEST>>
                                        ;*****************************************************************
                                        ;*SUBTEST       PORT ARBITRATION SYMMETRY TEST
                                        ;*****************************************************************
                                                SUPERVISOR              ;ENTER SUPERVISOR MODE
                                                BIS     #BIT14,PSW              ;DO IT TO IT
                                                .DSABL  CRF
                                                MOV     FIRST+BANK,BANK
                                                KERNEL                  ;ENTER KERNEL MODE
                                                MAP     BANK
052012  010346                                                                         MOV R3,-(SP)
052014  013703  002106                          MOV     BANK,R3
052020  004737  040700                          CALL    MAPPER
                                                .DSABL  CRF
052024  012603                                                                         MOV (SP)+,R3
                                                SUPERVISOR                      ;ENTER SUPERVISOR MODE
052026  052737  040000  177776                  BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF                      .
                                                BMOV    TSK05A,FIRST+2
052034  004537  043730                              JSR R5,BLOCK2
052040  060002                                      FIRST+2
052042  052240                                      TSK05A
                                                    .DSABL      CRF
                                                KERNEL                          ;ENTER KERNEL MODE
                                                CLR     PORTCOUNT(R0)
                                                MOV     R0,R4
                                                PUSH    100,102
052054  013746  000100                                                                 MOV 100,-(SP)
052060  013746  000102                                                                 MOV 102,-(SP)
                                                MOV     #1$,100
                                                MOV     #340,102
                                                MOV     #BIT6,LKS               ;ENABLE INTERRUPTS
                                                CLR     R0
                                                MOV     #FIRST,R1
                                                SPL     5
                                                MOV     #FIRST+2,SUPDOADD
                                                CALL    SUPD04
                                                CACHOFF                 ;TURN CACHE OFF
                                                CLR     LKS
                                                SPL     7
                                                CALL    SUPD04                  ;DO TEST AS BACKGND WHILE OTHERR CPU'S FINISH
                                                CACHOFF
                                                MAP     #0                      ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
052146  010346                                                                         MOV R3,-(SP)
052150  012703  000000                          MOV     #0,R3
052154  004737  040700                          CALL    MAPPER
                                                .DSABL  CRF
052160  012603                                                                         MOV (SP)+,R3
                                                MOV     R4,R0
                                                SUPERVISOR              ;ENTER SUPERVISOR MODE
052164  052737  040000  177776                  BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
052172  016060  002646  062646                  MOV     PORTCOUNT(R0),FIRST+PORTCOUNT(R0)
                                                KERNEL                  ;ENTER KERNEL MODE
                                                CLEAR   MARGIN,MAINT
052202  005037  002112                                                                 CLR  MARGIN
052206  005037  177750                                                                 CLR  MAINT
```

```
194 052212                              POP     102,100                 MOV (SP)+,102
    052212  012637  000102                                              MOV (SP)+,100
    052216  012637  000100
195 052222  000207                      RETURN
196 052224                      '$.     PUSH    R0                      MOV R0,-(SP)
    052224  010046
197 052226  010400                      MOV     R4,R0
198 052230  005260  002646              INC     PORTCOUNT(R0)
199 052234                              POP     R0                      MOV (SP)+,R0
    052234  012600
200 052236  000002                      RTI
201 052240  010505              TSK05A. MOV     R5,R5
202 052242  010505                      MOV     R5,R5
203 052244  010505                      MOV     R5,R5
204 052246  010505                      MOV     R5,R5
205 052250  010505                      MOV     R5,R5
206 052252  010505                      MOV     R5,R5
207 052254  010505                      MOV     R5,R5
208 052256  010505                      MOV     R5,R5
209 052260  010505                      MOV     R5,R5
210 052262  010505                      MOV     R5,R5
211 052264  010505                      MOV     R5,R5
212 052266  010505                      MOV     R5,R5
213 052270  010505                      MOV     R5,R5
214 052272  010505                      MOV     R5,R5
215 052274  077017                      SOB     R0,TSK05A
216 052276  000207                      RETURN
```

```
                                TASK06: SUBTST  <<STOP SLAVE PROGRAM>>
                                ;*************************************************************************
                                ;*SUBTEST        STOP SLAVE PROGRAM
                                ;*************************************************************************
052300  012706  000700                MOV     #USESTK,SP
052304  042737  001001  177572        BIC     #BIT9!BIT0,MMR0         ;DEENERGIZE MEMORY MANAGEMENT
052312  005037  002676                CLR     @DISPLAY
052316  005077  130446                CLR     @DISPLAY
052322  000137  011720                JMP     STOPCPU

052326                          TASK07: SUBTST  <<WRITE ONLY ADDRESS PATTERN IN HI BYTE>>
                                ;*************************************************************************
                                ;*SUBTEST        WRITE ONLY ADDRESS PATTERN IN HI BYTE
                                ;*************************************************************************
052326                                  SET     WRITEONLY
052326  012737  177777  002502                                                  MOV  #-1,WRITEONLY
052334  000403                        BR      TASK7A

052336                          TASK10: SUBTST  <<READ ONLY ADDRESS PATTERN IN HI BYTE>>
                                ;*************************************************************************
                                ;*SUBTEST        READ ONLY ADDRESS PATTERN IN HI BYTE
                                ;*************************************************************************
052336                                  SET     READONLY
052336  012737  177777  002504                                                  MOV  #-1,READONLY
052344                          TASK7A: SUPERVISOR              ;ENTER SUPERVISOR MODE
052344  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT
                                      .DSABL  CRF
052352  116001  062617                MOVB    FIRST+TASK+1(R0),R1
052356  013737  062106  002106        MOV     FIRST+BANK,BANK
052364  104417                        KERNEL                  ;ENTER KERNEL MODE
052366                                IF R1 EQ #0
052366  005701                                                                  TST R1
052370  001011                                                                  BNE L570
052372                                  BMOV  MTP001            ;ADDRESS PATTERN
052372  004537  043710                    JSR R5,BLOCK1
052376  026422                            MTP001
                                          .DSABL        CRF
052400  012700  060000                  MOV   #FIRST,R0
052404  005002                          CLR   R2
052406  010004                          MOV   R0,R4
052410  010205                          MOV   R2,R5
052412                                ELSE
052412  000413                                                                  BR L571
052414                                                                  L570:::::::
052414                                  BMOV  MTP002            ;COMPLEMENT ADDRESS PATTERN
052414  004537  043710                    JSR R5,BLOCK1
052420  026454                            MTP002
                                          .DSABL        CRF
052422  012700  160000                  MOV   #LAST+2,R0
052426  012702  000001                  MOV   #1,R2
052432  012704  060000                  MOV   #FIRST,R4
052436  012705  100001                  MOV   #100001,R5
052442                                END ;OF IF R1
052442                                                                  L571:::::::
052442  012701  040000                MOV     #SIZE,R1
052446  010103                        MOV     R1,R3
052450  012737  000207  177650        MOV     #207,UIPAR4     ;RETURN INSTRUCTION
```

```
    252 052456  012737  177652  002360          MOV     #UIPAR5,SUPDOADD        ;READ ONLY STARTING ADDRESS
    253 052464                                  CLEAR   MARGIN,MAINT
        052464  005037  002112                                                      CLR  MARGIN
        052470  005037  177750                                                      CLR  MAINT
    254 052474  104502                          CLRCSR                          ;CLEAR MK11 CSRS
    255 052476                                  IF WRITEONLY IS TRUE THEN $CALL SUPD01
        052476  005737  002502                                                      TST WRITEONLY
        052502  001402                                                          BEQ L572
        052504  004737  026042                                                      JSR PC,SUPD01
        052510                                                              L572:::::::
    256 052510                                  IF READONLY IS TRUE THEN $CALL SUPD03
        052510  005737  002504                                                      TST READONLY
        052514  001402                                                          BEQ L573
        052516  004737  026220                                                      JSR PC,SUPD03
        052522                                                              L573:::::::
    257 052522  104424                          CACHOFF                         ;TURN CACHE OFF
    258 052524                                  CLEAR   READONLY,WRITEONLY
        052524  005037  002504                                                      CLR  READONLY
        052530  005037  002502                                                      CLR  WRITEONLY
    259 052534  000207                          RETURN
```

```
 262 052536                             TASK11: SUBTST  <<RUN FIVE PATTERNS IN DESIGNATED 1/4 BANK>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       RUN FIVE PATTERNS IN DESIGNATED 1/4 BANK
                                        ;*****************************************************************************
 263 052536                                     SUPERVISOR              ;ENTER SUPERVISOR MODE
     052536  052737  040000  177776             BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
 264 052544  116001  062617                     MOVB    FIRST+TASK+1(R0),R1
 265 052550  013737  062106  002106             MOV     FIRST+BANK,BANK
 266 052556  104417                             KERNEL                  ;ENTER KERNEL MODE
 267 052560  072127  000011                     ASH     #9.,R1
 268 052564  010100                             MOV     R1,R0
 269 052566  012701  010000                     MOV     #SIZE/4,R1
 270 052572                                     SET     WRITEONLY,READONLY
     052572  012737  177777  002502                                                     MOV  #-1,WRITEONLY
     052600  012737  177777  002504                                                     MOV  #-1,READONLY
 271 052606  004737  051530                     CALL    SLPAT0
 272 052612  004737  051534                     CALL    SLPAT1
 273 052616  004737  051542                     CALL    SLPAT2
 274 052622  004737  051550                     CALL    SLPAT3
 275 052626  004737  051556                     CALL    SLPAT4
 276 052632                                     CLEAR   WRITEONLY,READONLY
     052632  005037  002502                                                     CLR  WRITEONLY
     052636  005037  002504                                                     CLR  READONLY
 277 052642  000207                             RETURN
 278
 279 052644                             TASK12: SUBTST  <<WRITE & READ A SKEWED UP ADDRESS TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       WRITE & READ A SKEWED UP ADDRESS TEST
                                        ;*****************************************************************************
 280 052644                                     SUPERVISOR              ;ENTER SUPERVISOR MODE
     052644  052737  040000  177776             BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
 281 052652  116001  062617                     MOVB    FIRST+TASK+1(R0),R1
 282 052656  104417                             KERNEL                  ;ENTER KERNEL MODE
 283
 284                                            ;PAY ATTENTION NOW.
 285                                            ;R0 - MULTIPORT ID # (0,2,4,6)
 286                                            ;R1 = OFFSET STARTING ADDRESS (0,2,4,6)
 287 052660  010004                             MOV     R0,R4
 288 052662  060104                             ADD     R1,R4           ;R4 IS NOW UNIQUE AMONST THE 4 CPU'S
 289
 290 052664  012705  010000                     MOV     #SIZE/4,R5
 291 052670  012703  060000                     MOV     #FIRST,R3
 292 052674                                     BMOV    MTPA32
     052674  004537  043710                         JSR R5,BLOCK1
     052700  034772                             MTPA32
                                                .DSABL      CRF
 293 052702  104415                             SAVREG
 294 052704  004737  026042                     CALL    SUPD01
 295 052710                                     BMOV    MTPB32
     052710  004537  043710                         JSR R5,BLOCK1
     052714  035020                             MTPB32
                                                .DSABL      CRF
 296 052716  104416                             RESREG
 297 052720  004737  026056                     CALL    SUPD02
 298 052724  000207                             RETURN
```

```
    301 052726                          TASK13: SUBTST  <<SETUP FOR ASRB TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SETUP FOR ASRB TEST
                                        ;*****************************************************************************
    302 052726                                  BMOV    TSK13A
        052726  004537  043710                      JSR R5,BLOCK1
        052732  053100                              TSK13A
                                                    .DSABL      CRF
    303 052734  012777  177640  130000          MOV     #UIPAR0,@IISTVEC        ;CAUSE WE SIMULATE TRAPS
    304 052742                                  SUPERVISOR                      ;ENTER SUPERVISOR MODE
        052742  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
    305 052750  013737  062106  002106          MOV     FIRST+BANK,BANK
    306 052756  052760  100000  062616          BIS     #BIT15,FIRST+TASK(R0)   ;ACK
    307 052764  104417                          KERNEL                          ;ENTER KERNEL MODE
    308 052766                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
        052766  010346                                                                      MOV R3,-(SP)
        052770  013703  002106                  MOV     BANK,R3
        052774  004737  040700                  CALL    MAPPER
                                                .DSABL  CRF
        053000  012603                                                                      MOV (SP)+,R3
    309 053002                                  IF CPUBIT NE #MASTER
        053002  023727  002114  000020                                                      CMP CPUBIT,#MASTER
        053010  001432                                                                      BEQ L574
    310 053012                                    FOR R2 := #FIRST TO #FIRST+34 BY #4
        053012  012702  060000                                                              MOV #FIRST,R2
        053016                                                                  B74:;;;;;;
    311 053016                                      FOR I := #1 TO #1000.
        053016  012737  000001  002602                                                      MOV #1,I
        053024                                                                  B75:;;;;;;
    312 053024                                        SUPERVISOR                ;ENTER SUPERVISOR MODE
        053024  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT!
                                                .DSABL  CRF
    313 053032  005737  060002          1$:             TST     FIRST+2
    314 053036  001775                                  BEQ     1$
    315                                                 ;DISPATCH THRU THE IIST VECTOR
    316 053040  017701  127676                          MOV     @IISTVEC,R1
    317 053044  004711                                  CALL    (R1)
    318 053046                                        END ;OF FOR I
        053046  005237  002602                                                              INC I
        053052  023727  002602  001750                                                      CMP I,#1000.
        053060  003761                                                                      BLE B75
        053062                                                                  E75:;;;;;;;
    319 053062                                    END ;OF FOR R2
        053062  062702  000004                                                              ADD #4,R2
        053066  020227  060034                                                              CMP R2,#FIRST+34
        053072  003751                                                                      BLE B74
        053074                                                                  E74:;;;;;;;
    320 053074  104417                            KERNEL                ;ENTER KERNEL MODE
    321 053076                                  END ;OF IF CPUBIT
        053076                                                                  L574:;;;;;;
    322 053076  000207                          RETURN
    323
    324 053100  000240                  TSK13A: NOP                     ;V177640
    325 053102  000240                          NOP                     ;V177642
    326 053104  000240                          NOP                     ;V177644
    327 053106  000240                          NOP                     ;V177646
```

```
328 053110  000240                        NOP                     ;V177650
329 053112  000240                        NOP                     ;V177652
330 053114  000240                        NOP                     ;V177654
331 053116  000240                        NOP                     ;V177656
332 053120  000240                        NOP                     ;V177660
333 053122                                SUPERVISOR              ;V177662 ;ENTER SUPERVISOR MODE
    053122  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT!
                                          .DSABL  CRF
334 053130  106212                        ASRB    (R2)            ;V177670
335 053132  000137  053136                JMP     TSK13B          ;V177672
```

```
338 053136                          TSK13B: SUBTST  <<RECOVER FROM TASK13 - TRAP FROM IIST>>
                                    ;*********************************************************************
                                    ;*SUBTEST       RECOVER FROM TASK13 - TRAP FROM IIST
                                    ;*********************************************************************
339 053136                                  ON.ERROR
    053136  103021                                                                      BCC L575
340 053140                            SET   SLFLAG(R0)                    ;I LOCKED IT!!!
    053140  012760  177777  002656                                                      MOV  #-1,SLFLAG(R0)
341 053146  163777  002730  127566        SUB   SLAVES,@IISTVEC
342 053154  163777  002730  127560        SUB   SLAVES,@IISTVEC
343 053162                                IF @IISTVEC LO #UIPAR0 THEN LET @IISTVEC := #UIPAR0
    053162  027727  127554  177640                                                      CMP @IISTVEC,#UIPAR0
    053170  103003                                                                     BHIS L576
    053172  012777  177640  127542                                                     MOV #UIPAR0,@IISTVEC
    053200                                                                      L576:;;;;;;
344 053200                                ELSE
    053200  000414                                                                     BR L577
    053202                                                                      L575:;;;;;
345 053202  005060  002656                CLR   SLFLAG(R0)                    ;IT WAS LOCKED BY SOMEONE ELSE
346 053206  062777  000002  127526        ADD   #2,@IISTVEC
347 053214                                IF @IISTVEC HI #UDPAR1 THEN LET @IISTVEC := #UDPAR1
    053214  027727  127522  177662                                                      CMP @IISTVEC,#UDPAR1
    053222  101403                                                                     BLOS L600
    053224  012777  177662  127510                                                     MOV #UDPAR1,@IISTVEC
    053232                                                                      L600:;;;;;;
348 053232                                END ;OF ON.NOERROR
    053232                                                                      L577:;;;;;;
349 053232                                MAP     #0                          ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
    053232  010346                                                                     MOV R3,-(SP)
    053234  012703  000000                MOV     #0,R3
    053240  004737  040700                CALL    MAPPER
                                          .DSABL  CRF
    053244  012603                                                                     MOV (SP)+,R3
350 053246  016060  002656  062656        MOV     SLFLAG(R0),FIRST+SLFLAG(R0)
351 053254                                MAP     BANK                        ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
    053254  010346                                                                     MOV R3,-(SP)
    053256  013703  002106                MOV     BANK,R3
    053262  004737  040700                CALL    MAPPER
                                          .DSABL  CRF
    053266  012603                                                                     MOV (SP)+,R3
352 053270  005037  060002                CLR     FIRST+2
353 053274  000207                        RETURN
```

```
                                TASK14: SUBTST  <<RESET FROM ASRB TEST>>
                                ;*********************************************************************
                                ;*SUBTEST        RESET FROM ASRB TEST
                                ;*********************************************************************
053276  000237                          SPL     7
053300  012777  061216  127434          MOV     #SLAVUP,@IISTVEC
053306  000207                          RETURN
                                TASK15: SUBTST  <<RUN SLAVE IN CSR TESTS>>
                                ;*********************************************************************
                                ;*SUBTEST        RUN SLAVE IN CSR TESTS
                                ;*********************************************************************
053310  004737  016664                  CALL    MKCONTROL
053314  000207                          RETURN
                                TASK16: SUBTST  <<SET MARGIN 6, CPU HAS I/O PRIORITY>>
                                ;*********************************************************************
                                ;*SUBTEST        SET MARGIN 6, CPU HAS I/O PRIORITY
                                ;*********************************************************************
053316  012737  000014  177750          MOV     #14,MAINT
053324  012737  000006  002112          MOV     #6,MARGIN
053332  000207                          RETURN
                                TASK17: SUBTST  <<CREATE STALE DATA TEST>>
                                ;*********************************************************************
                                ;*SUBTEST        CREATE STALE DATA TEST
                                ;*********************************************************************
053334                                  SUPERVISOR
053334  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT.
                                        .DSABL  CRF
053342  013737  062106  002106          MOV     FIRST+BANK,BANK
053350  104417                          KERNEL
053352                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
053352  010346                                                                  MOV R3,-(SP)
053354  013703  002106                  MOV     BANK,R3
053360  004737  040700                  CALL    MAPPER
                                        .DSABL  CRF
053364  012603                                                                  MOV (SP)+,R3
053366                                  SUPERVISOR                      ;ENTER SUPERVISOR MODE
053366  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT.
                                        .DSABL  CRF
053374  012700  060000                  MOV     #FIRST,R0
053400  012701  060004                  MOV     #FIRST+4,R1
053404  022711  047507          1$:     CMP     #'GO,(R1)               ;TIME TO GO?
053410  001375                          BNE     1$                      ;NO - LOOP
053412  012710  177777                  MOV     #-1,(R0)                ;WRITE WORD
053416  104417                          KERNEL                          ;ENTER KERNEL MODE
053420  000207                          RETURN
```

```
    385 053422                          TASK20: SUBTST  <<CACHE FLUSH TEST>>
                                        ;*********************************************************************
                                        ;*SUBTEST       CACHE FLUSH TEST
                                        ;*********************************************************************
    386 053422                                  BMOV    TSK20A
        053422  004537  043710                      JSR R5,BLOCK1
        053426  053602                              TSK20A
                                                    .DSABL      CRF
    387 053430                                  SUPERVISOR                      ;ENTER SUPERVISOR MODE
        053430  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT
                                                .DSABL  CRF
    388 053436  013737  062106  002106          MOV     FIRST+BANK,BANK
    389 053444  104417                          KERNEL                          ;RETURN TO KERNEL MODE
    390 053446                                  MAP     BANK
        053446  010346                                                                      MOV R3,-(SP)
        053450  013703  002106                  MOV     BANK,R3
        053454  004737  040700                  CALL    MAPPER
                                                .DSABL  CRF
        053460  012603                                                                     MOV (SP)+,R3
    391 053462  012700  060000                  MOV     #FIRST,R0
    392 053466  012701  060004                  MOV     #FIRST+4,R1
    393 053472  005002                          CLR     R2
    394
    395                                         ;WAIT FOR ANY FLUSH TO FINISH
    396 053474  077201                  1$:     SOB     R2,1$
    397
    398 053476                                  SUPERVISOR                      ;ENTER SUPERVISOR MODE
        053476  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
    399 053504  004737  177640                  CALL    FASTCITY
    400 053510  005060  000004                  CLR     4(R0)                   ;KILL THE GO SIGNAL
    401 053514  104417                          KERNEL                          ;ENTER KERNEL MODE
    402
    403                                         ;VERIFY STALE DATA
    404 053516  022701  000000                  CMP     #0,R1                   ;CHECK FOR STALE DATA
    405 053522  001411                          BEQ     2$                      ;OK - SKIP
    406 053524  012737  000000  002050          MOV     #0,GOOD                 ;REPORT ERROR
    407 053532  010137  002056                  MOV     R1,BAD
    408 053536  012737  060000  002040          MOV     #FIRST,ADDRESS
    409 053544  104055                          ERROR   +55
    410
    411                                         ;VERIFY THAT FLUSHING GETS RID OF STALE DATA
    412 053546  022702  177777          2$:     CMP     #-1,R2                  ;CHECK FOR GOOD DATA
    413 053552  001411                          BEQ     5$                      ;OK - SKIP
    414 053554  012737  177777  002050          MOV     #-1,GOOD                ;REPORT ERROR
    415 053562  010237  002056                  MOV     R2,BAD
    416 053566  012737  060000  002040          MOV     #FIRST,ADDRESS
    417 053574  104056                          ERROR   +56
    418
    419 053576  104424                  5$:     CACHOFF                 ;TURN CACHE OFF
    420 053600  000207                          RETURN
    421
    422 053602                          TSK20A: SUBTST  <<CACHE FLUSH TEST (FOR PAR'S)>>
                                        ;*********************************************************************
                                        ;*SUBTEST       CACHE FLUSH TEST (FOR PAR'S)
                                        ;*********************************************************************
    423 053602  012737  000401  177746          MOV     #BIT8!BIT0,CONTRL       ;V177640 ;TURN ON CACHE & FLUSH IT
```

```
  424 053610  012710  000000              MOV     #0,(R0)                 ;V177646 ;WRITE FRESH DATA
  425 053614  005710                      TST     (R0)                    ;V177652  ;READ - CREATING A CACHE HIT
  426 053616  012711  047507              MOV     #'GO,(R1)               ;V177654  ;SIGNAL SLAVES TO MAKE STALE DATA
  427 053622  077201                  1$: SOB     R2,1$                   ;V177660  ;WAIT FOR SLAVES TO FINISH
  428 053624  011001                      MOV     (R0),R1                 ;V177662  ;STALE DATA ---> R1
  429 053626  012737  000401  177746      MOV     #BIT8!BIT0,CONTRL       ;V177664  ;FLUSH CACHE AGAIN
  430 053634  011002                      MOV     (R0),R2                 ;V177672  ;FRESH DATA ---> R2
  431 053636  000207                      RETURN                          ;V177674
```

```
434 053640                          MRUNSETUP:SUBTST        <<SETUP EXECUTION CONTENTION TEST>>
                                    ;*********************************************************************
                                    ;*SUBTEST       SETUP EXECUTION CONTENTION TEST
                                    ;*********************************************************************
435 053640                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
    053640  010346                                                                      MOV R3,-(SP)
    053642  013703  002106                  MOV     BANK,R3
    053646  004737  040700                  CALL    MAPPER
                                            .DSABL  CRF
    053652  012603                                                                      MOV (SP)+,R3
436 053654  012700  060000                  MOV     #FIRST,R0
437 053660                                  WHILE R0 LO #LAST
    053660                                                              B76:;;;;;;
    053660  020027  157776                                                          CMP R0,#LAST
    053664  103023                                                                  BHIS L601
438 053666  004737  074720                    CALL  $RAND
439 053672  013701  002714                    MOV   SEEDHI,R1
440 053676  012702  000020                    MOV   #16.,R2
441 053702                                    SUPERVISOR              ;ENTER SUPERVISOR MODE
    053702  052737  040000  177776          BIS     #BIT14,PSW                ;DO IT TO IT.
                                            .DSABL  CRF
442 053710                                    THRU R2
    053710                                                              B77:;;;;;;
443 053710  006101                              ROL R1
444 053712                                      ON.ERROR
    053712  103003                                                                 BCC L602
445 053714  012720  005210                        MOV       #5210,(R0)+     ;INC (R0) INSTRUCTION
446 053720                                      ELSE
    053720  000402                                                                 BR L603
    053722                                                              L602:;;;;;;
447 053722  012720  005710                      MOV       #5710,(R0)+     ;TST (R0) INSTRUCTION
448 053726                                      END ;OF ON.ERROR
    053726                                                              L603:;;;;;;
449 053726                                    END ;OF THRU R2
    053726  077210                                                                 SOB R2,B77 ; **** EIS INST.
    053730                                                              E77:;;;;;;
450 053730  104417                             KERNEL                          ;ENTER KERNEL MODE
451 053732                                  END ;OF WHILE R0
    053732  000752                                                                 BR B76
    053734                                                              L601:;;;;;;
    053734                                                              E76:;;;;;;
452 053734                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
    053734  052737  040000  177776          BIS     #BIT14,PSW                ;DO IT TO IT.
                                            .DSABL  CRF
453 053742  012740  000207                  MOV     #207,-(R0)                ;RETURN INSTRUCTION
454 053746  104417                          KERNEL                  ;ENTER KERNEL MODE
455 053750  000207                          RETURN
```

```
                                SJPM13: SUBTST  <<MULTIPORT ASRB TEST (IN SUPERVISOR SPACE)>>
                                ;*********************************************************************
                                ;*SUBTEST        MULTIPORT ASRB TEST (IN SUPERVISOR SPACE)
                                ;*********************************************************************
                                        .ENABL  LSB
                                MOV     #-13,MDISPLAY
                                MOV     MDISPLAY,@DISPLAY
                                FOR BANK :- #1 TO #167
053766  012737  000001  002106                                                  MOV #1,BANK
053774                                                                  B100:::::::
                                  MOV   ALLCPUS,CPUBIT
                                  CALL  EXBANK
                                  MOV   #MASTER,CPUBIT
                                  IF PFLAG IS FALSE AND ACFLAG IS TRUE
054014  005737  002130                                                          TST PFLAG
054020  001153                                                                  BNE L604
054022  005737  002124                                                          TST ACFLAG
054026  001550                                                                  BEQ L604
                                    MAP BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
054030  010346                                                                  MOV R3,-(SP)
054032  013703  002106          MOV     BANK,R3
054036  004737  040700          CALL    MAPPER
                                .DSABL  CRF
054042  012603                                                                  MOV (SP)+,R3
                                    SUPERVISOR                  ;ENTER SUPERVISOR
054044  052737  040000  177776  BIS     #BIT14,PSW              ;DO IT TO IT!
                                .DSABL  CRF
                                    CLEAR PORTCOUNT,PORTCOUNT+2,PORTCOUNT+4,PORTCOUNT+6,FIRST+2
054052  005037  002646                                                          CLR  PORTCOUNT
054056  005037  002650                                                          CLR  PORTCOUNT+2
054062  005037  002652                                                          CLR  PORTCOUNT+4
054066  005037  002654                                                          CLR  PORTCOUNT+6
054072  005037  060002                                                          CLR  FIRST+2
                                    KERNEL                      ;ENTER KERNEL MODE
                                    FOR R0 := #0 TO SLAVES
054100  005000                                                                  CLR R0
054102                                                                  B101:::::::
                                      MOV       R0,R1
                                      ASL       R1
                                      MOV       #13,TASK(R1)            ;ORDERS TO SETUP FOR ASRB TEST
                                    END ;OF FOR R0
054114  005200                                                                  INC R0
054116  020037  002730                                                          CMP R0,SLAVES
054122  003767                                                                  BLE B101
054124                                                                  E101:::::::
                                    CALL        TASKDO
                                    MAP BANK
054130  010346                                                                  MOV R3,-(SP)
054132  013703  002106          MOV     BANK,R3
054136  004737  040700          CALL    MAPPER
                                .DSABL  CRF
054142  012603                                                                  MOV (SP)+,R3
                                    FOR R0 :- #0 TO SLAVES
054144  005000                                                                  CLR R0
054146                                                                  B1C2:::::::
                                      MOV       R0,R1
                                      ASL       R1
```

```
481 054152  012737  061165  002574                MOV     #5*SECONDS,HUNGTIME
482 054160  004737  072154          2$:           CALL    QUE
483 054164                                        ON.ERROR
    054164  103005                                                                BCC L605
484 054166  010037  002056                          MOV     R0,BAD
485 054172  104060                                  ERROR   +60             ;SLAVE HUNG SYSTEM!
486 054174                                          $RETURN ERROR
    054174  000261                                                             SEC
    054176  000207                                                             RTS PC
487 054200                                        END ;OF ON.ERROR
    054200                                                              L605:::::::
488 054200  005761  002616                        TST     TASK(R1)
489 054204  100365                                BPL     2$
490 054206                                      END ;OF FOR R0
    054206  005200                                                             INC R0
    054210  020037  002730                                                     CMP R0,SLAVES
    054214  003754                                                             BLE B102
    054216                                                              E102:::::::
491                                             ;I ASSUME THEY HAVE FINISHED COMPLETELY AFTER THIS DELAY
492 054216  005000                              CLR R0
493 054220  077001                  1$:         SOB R0,1$
494 054222                                      FOR R2 :  #FIRST TO #FIRST+34 BY #4
    054222  012702  060000                                                       MOV #FIRST,R2
    054226                                                              B103:::::::
495 054226                                        FOR I := #1 TO #1000.
    054226  012737  000001  002602                                             MOV #1,I
    054234                                                              B104:::::::
496 054234                                          SUPERVISOR                  ;ENTER SUPERVISOR MODE
    054234  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT!
                                            .DSABL  CRF
497 054242  012712  000001                          MOV     #1,(R2)             ;UNLOCK TEST LOCATION
498 054246  004737  054544                          CALL    WAKEUP
499
500                                                 ;RECORD WINNER(S)
501 054252  005000                                  CLR     R0
502 054254                                          FOR R1 := #0 TO #6 BY #2
    054254  005001                                                             CLR R1
    054256                                                              B105:::::::
503 054256                                            IF SLFLAG(R1) IS TRUE
    054256  005761  002656                                                     TST SLFLAG(R1)
    054262  001403                                                             BEQ L606
504 054264  005261  002646                              INC PORTCOUNT(R1)
505 054270  005200                                      INC R0
506 054272                                            END ;OF IF SLFLAG
    054272                                                              L606:::::::
507 054272                                          END ;OF FOR R1
    054272  062701  000002                                                     ADD #2,R1
    054276  020127  000006                                                     CMP R1,#6
    054302  003765                                                             BLE B105
    054304                                                              E105:::::::
508
509                                                 ;CHECK FOR ONE & ONLY ONE LOCK
510 054304                                          IF R0 NE #1
    054304  020027  000001                                                     CMP R0,#1
    054310  001401                                                             BEQ L607
511 054312  104033                                    ERROR +33
512 054314                                          END ;OF IF R0
```

```
     054314
 513 054314                                          END ;OF FOR I
     054314  005237  002602                                         INC I
     054320  023727  002602  001750                                 CMP I,#1000.
     054326  003742                                                 BLE B104
     054330                                                  E104:::::::
 514 054330                                          END ;OF FOR R2
     054330  062702  000004                                         ADD #4,R2
     054334  020227  060034                                         CMP R2,#FIRST+34
     054340  003732                                                 BLE B103
     054342                                                  E103:::::::
 515 054342  104417                                          KERNEL
 516 054344  004737  054472                                  CALL        M13BAI          ;CALL BALANCE TEST
 517 054350                                          END ;OF IF PFLAG
     054350                                                  L604:::::::
 518 054350                                          END ;OF FOR BANK
     054350  005237  002106                                         INC BANK
     054354  023727  002106  000167                                 CMP BANK,#167
     054362  003604                                                 BLE B100
     054364                                                 .E100:::::::
 519 054364                                          FOR R0 :  #1 TO SLAVES
     054364  012700  000001                                         MOV #1,R0
     054370                                                  B106:::::::
 520 054370  010001                                          MOV   R0,R1
 521 054372  006301                                          ASL   R1
 522 054374  012761  000014  002616                          MOV   #14,TASK(R1)          ;ORDERS TO RESET FROM ASRB TEST
 523 054402                                          END ;OF FOR R0
     054402  005200                                                 INC R0
     054404  020037  002730                                         CMP R0,SLAVES
     054410  003767                                                 BLE B106
     054412                                                  E106:::::::
 524 054412                                          FOR R0 := #1 TO SLAVES
     054412  012700  000001                                         MOV #1,R0
     054416                                                  B107:::::::
 525 054416  010001                                          MOV   R0,R1
 526 054420  006301                                          ASL   R1
 527 054422  012737  061165  002574                            MOV #5*SECONDS,HUNGTIME
 528 054430  004737  072154          3$:                     CALL  QUE
 529 054434                                                  ON.ERROR
     054434  103005                                                 BCC L610
 530 054436  010037  002056                                      MOV R0,BAD
 531 054442  104060                                              ERROR       +60         ;SLAVE HUNG SYSTEM!
 532 054444                                                      $RETURN     ERROR
     054444  000261                                                 SEC
     054446  000207                                                 RTS PC
 533 054450                                          END ;OF ON.ERROR
     054450                                                  L610:::::::
 534 054450  005761  002616                              TST   TASK(R1)              ;WAIT FOR ALL CPU'S DONE
 535 054454  100365                                      BPL   3$
 536 054456                                          END ;OF FOR R0
     054456  005200                                                 INC R0
     054460  020037  002730                                         CMP R0,SLAVES
     054464  003754                                                 BLE B107
     054466                                                  E107:::::::
 537 054466                                          $RETURN NOERROR
     054466  000241                                                 CLC
     054470  000207                                                 RTS PC
```

```
530                                     .DSABL  LSB
```

```
                                                M*3BAL: SUBTST  <<BALANCE TEST>>
                                                ;*****************************************************************************
                                                ;*SUBTEST        BALANCE TEST
                                                ;*****************************************************************************
                                                        BEGIN ASRBALANCE
                                                                                                B110:;;;;;;
                                                        FOR R0 :- #0 TO SLAVES
                                                                                                        CLR R0
                                                                                                B111:;;;;;;
                                                          MOV   R0,R1
                                                          ASL   R1
                                                          MOV   PORTCOUNT,R2
                                                          SUB   PORTCOUNT(R1),R2
                                                          ADD   #256.,R2                ;# HERE & IN NEXT INST IS + OR - COUNT SPEC
                                                          IF R2 LT #0 OR R2 GT #256.*2
                                                                                                        TST R2
                                                                                                        BLT L611
                                                                                                        CMP R2,#256.*2
                                                                                                        BLE L612
                                                                                                L611:;;;;;;
                                                            ERROR       +53
                                                            LEAVE       ASRBALANCE
                                                                                                        BR E110
                                                          END ;OF IF R2
                                                                                                L612:;;;;;;
                                                        END ;OF FOR R0
                                                                                                        INC R0
                                                                                                        CMP R0,SLAVES
                                                                                                        BLE B111
                                                                                                E111:;;;;;;;
                                                        END ASRBALANCE
                                                                                                E110:;;;;;;
                                                        RETURN

                                                        ;WAKE UP EVERY CPU
                                                WAKEUP: SET     FIRST+2
                                                                                                        MOV  #-1,FIRST+2
                                                        ;INCLUDING MYSELF
                                                        NOP
                                                        NOP
                                                        CLR     R0
                                                        MOV     @IISTVEC,R1
                                                        CALL    (R1)
                                                        RETURN
```

```
                                        .SBTTL  ERROR DATA (SUPERVISOR) SETUP STUFF
                                $PER25: LET ADDRESS := R1 - #2
054570  010137  002040                                                          MOV R1,ADDRESS
054574  162737  000002  002040                                                  SUB #2,ADDRESS
                                        IF ABORTFLAG IS FALSE
054602  005737  002142                                                          TST ABORTFLAG
054606  001007                                                                  BNE L613
                                          SUPERVISOR            ;ENTER SUPERVISOR MODE
054610  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT!
                                        .DSABL  CRF
                                          LET BAD :  -2(R1)
054616  016137  177776  002056                                                  MOV -2(R1),BAD
                                          KERNEL                        ;ENTER KERNEL MODE
                                        END ;OF IF ABORTFLAG
                                                                        L613:;;;;;;
                                        IF 177654 EQ #0
054626  005737  177654                                                          TST 177654
054632  001003                                                                  BNE L614
                                          LET GOOD := R2
054634  010237  002050                                                          MOV R2,GOOD
                                        ELSE
054640  000402                                                                  BR L615
                                                                        L614:;;;;;;
                                          LET GOOD := R3
054642  010337  002050                                                          MOV R3,GOOD
                                        END ;OF IF
                                                                        L615:;;;;;;
                                        JMP     PERRAW

                                PERRA3: SUBTST  <<DATA WAS 3 WORDS>>
                                ;*****************************************************************************
                                ;*SUBTEST        DATA WAS 3 WORDS
                                ;*****************************************************************************
                                        IF BADPC EQ #0 THEN $CALL BADSTACK
054652  005737  002026                                                          TST BADPC
054656  001002                                                                  BNE L616
054660  004737  036770                                                          JSR PC,BADSTACK
                                                                        L616:;;;;;;
                                        PUSH    R0
054664  010046                                                                  MOV R0,-(SP)
                                        CHK1DIS                 ;DISABLE ECC & WRITE CHECKBITS FROM 1 SELECTED CSR
                                        READCSR
054672  013700  002144                MOV     CSR,R0
054676  000300                        SWAB    R0
054700  042700  177600                BIC     #^C177,R0
054704  104503                        CLR1CSR                 ;CLEAR 1 SELECTED MK11 CSR
                                        LET ADDRESS := R1
054706  010137  002040                                                          MOV R1,ADDRESS
                                        CLR     GOOD
                                        SUPERVISOR              ;ENTER SUPERVISOR MODE
054716  052737  040000  177776        BIS     #BIT14,PSW              ;DO IT TO IT!
                                        .DSABL  CRF
054724  011137  002056                MOV     (R1),BAD
054730  016137  000002  002060        MOV     2(R1),BAD2
054736  104417                        KERNEL                  ;ENTER KERNEL MODE
054740  110037  002062                MOVB    R0,BAD3
054744  105037  002063                CLRB    BAD3+1
```

```
599 054750  004737  065564          CALL    PERBNK
600 054754  104034                  ERROR   +34
601 054756                          POP     R0
    054756  012600                                          MOV (SP)+,R0
602 054760  000002                  RTI
```

```
    605 054762                          $PER30: LET GOOD := R1
        054762  010137  002050                                                  MOV R1,GOOD
    606 054766                                  LET ADDRESS :  (SP) - 16
        054766  011637  002040                                                  MOV (SP),ADDRESS
        054772  163737  000016  002040                                          SUB 16,ADDRESS
    607 055000                                  IF ABORTFLAG IS FALSE
        055000  005737  002142                                                  TST ABORTFLAG
        055004  001007                                                         BNE L617
    608 055006                                    SUPERVISOR            ;ENTER SUPERVISOR MODE
        055006  052737  040000  177776          BIS     #BIT14,PSW            ;DO IT TO IT.
                                                .DSABL  CRF
    609 055014                                    LET BAD :- @ADDRESS
        055014  017737  125020  002056                                          MOV @ADDRESS,BAD
    610 055022  104417                            KERNEL                      ;ENTER KERNEL MODE
    611 055024                                  END ;OF IF ABORTFLAG
        055024                                                          L617:;;;;;;
    612 055024  000137  065330                  JMP PERRAW
    613
    614 055030                          GETDATA:SUBTST  <<GET DATA FROM ABORTED AREA IF POSSIBLE>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       GET DATA FROM ABORTED AREA IF POSSIBLE
                                        ;*****************************************************************************
    615 055030                          PUSH    R0,4,114
        055030  010046                                                          MOV R0,-(SP)
        055032  013746  000004                                                  MOV 4,-(SP)
        055036  013746  000114                                                  MOV 114,-(SP)
    616 055042  010637  055156          MOV     SP,GETDA1
    617 055046  012737  055122  000004  MOV     #1$,4
    618 055054  012737  055122  000114  MOV     #1$,114
    619 055062  013700  002040          MOV     ADDRESS,R0
    620 055066  052737  000001  177750  BIS     #BIT0,MAINT
    621 055074  052737  004000  177746  BIS     #BIT11,CONTRL           ;DISABLE ABORTS
    622 055102                          SUPERVISOR
        055102  052737  040000  177776  BIS     #BIT14,PSW              ;DO IT TO IT!
                                        .DSABL  CRF
    623 055110  011037  002056          MOV     (R0),BAD
    624 055114  104417                  KERNEL
    625 055116  005037  002142          CLR     ABORTFLAG
    626 055122  013706  055156  1$:     MOV     GETDA1,SP               ;RESTORE KNOWN GOOD STACK POINTER
    627 055126  042737  004000  177746  BIC     #BIT11,CONTRL           ;ENABLE ABORTS
    628 055134  042737  000001  177750  BIC     #BIT0,MAINT
    629 055142                          POP     114,4,R0
        055142  012637  000114                                                 MOV (SP)+,114
        055146  012637  000004                                                 MOV (SP)+,4
        055152  012600                                                         MOV (SP)+,R0
    630 055154  000207                  RETURN
    631 055156  000000          GETDA1: 0
```

```
                                        .SBTTL  POWER FAIL AUTO RESTART
                                        .SBTTL  ROUTINE POWER DOWN AND UP
                                ;***************************************************************************
                                ;POWER DOWN ROUTINE
055160                          $PWRDN: IF CPUBIT NE #MASTER
055160  023727  002114  000020                                                  CMP CPUBIT,#MASTER
055166  001402                                                                  BEQ L620
055170  000000                  DNSLAV:   HALT
055172  000776                            BR    DNSLAV
055174                                  END ;OF IF CPUBIT
055174                                                                  L620:::::::
055174  012737  000376  002760          MOV     #376,PWLOCK
                                        ;SAVE CACHE & MARGIN STATUS
055202                                  PUSH    CONTRL,MAINT
055202  013746  177746                                                          MOV CONTRL,-(SP)
055206  013746  177750                                                          MOV MAINT,-(SP)
055212  104423                          CACHON                          ;TURN CACHE ON
055214  012737  056134  000024          MOV     #$ILLUP,PWRVEC ;;SET FOR FAST UP
055222  012737  000340  000026          MOV     #340,PWRVEC+2   ;;PRIO:7
055230                                  PUSH    R0,R1,R2,R3,R4,R5,CSRNO
055230  010046                                                                  MOV R0,-(SP)
055232  010146                                                                  MOV R1,-(SP)
055234  010246                                                                  MOV R2,-(SP)
055236  010346                                                                  MOV R3,-(SP)
055240  010446                                                                  MOV R4,-(SP)
055242  010546                                                                  MOV R5,-(SP)
055244  013746  002256                                                          MOV CSRNO,-(SP)
                                        ;SAVE USER PAR'S & PDR7
055250  012700  177700                  MOV     #177700,R0
055254  012701  000021                  MOV     #17.,R1
055260                          1$:     PUSH    -(R0)
055260  014046                                                                  MOV -(R0),-(SP)
055262  077102                          SOB     R1,1$
                                        ;SAVE SUPERVISOR PAR'S
055264  012700  172300                  MOV     #172300,R0
055270  012701  000020                  MOV     #16.,R1
055274                          2$:     PUSH    -(R0)
055274  014046                                                                  MOV -(R0),-(SP)
055276  077102                          SOB     R1,2$
055300                                  IF RLFLAG IS TRUE THEN $CALL WOOPS
055300  005737  002134                                                          TST RLFLAG
055304  001402                                                                  BEQ L621
055306  004737  056160                                                          JSR PC,WOOPS
055312                                                                  L621:::::::
                                        ;COPY KERNEL MAP TO USER & SUPERVISOR
055312  012700  172300                  MOV     #KIPDR0,R0
055316  012701  177600                  MOV     #UIPDR0,R1
055322  012702  172200                  MOV     #SIPDR0,R2
055326  012703  000040                  MOV     #32.,R3
055332  011021                  3$:     MOV     (R0),(R1)+
055334  012022                          MOV     (R0)+,(R2)+
055336  077303                          SOB     R3,3$
```

```
669                                     ;SAVE USER & SUPERVISOR STACK POINTERS
670 055340                              USER
    055340  052737  140000  177776      BIS     #BIT15!BIT14,PSW                ;DO IT TO IT
                                        .DSABL  CRF
671 055346  010600                      MOV     USP,R0
672 055350  104417                      KERNEL                  ;ENTER KERNEL MODE
673 055352                              PUSH    R0
    055352  010046                                                                      MOV R0,-(SP)
674 055354                              SUPERVISOR              ;ENTER SUPERVISOR MODE
    055354  052737  040000  177776      BIS     #BIT14,PSW              ;DO IT TO IT
                                        .DSABL  CRF
675 055362  010600                      MOV     SSP,R0
676 055364  104417                      KERNEL                  ;ENTER KERNEL MODE
677 055366                              PUSH    R0
    055366  010046                                                                      MOV R0,-(SP)
678                                     ;SAVE MK11 REGISTERS
679 055370  013701  002334              MOV     MKCSRS,R1       ;GET CSR'S BYTE
680 055374                              BEGIN LCSRSAVE
    055374                                                                  B112:::::::
681 055374                                FOR CSRNO := #0 TO #34 BY #4
    055374  005037  002256                                                             CLR CSRNO
    055400                                                                  B113:::::::
682 055400  106301                          ASLB        R1
683 055402                                  ON.ERROR
    055402  103005                                                                     BCC L622
684 055404  104426                            READCSR
685 055406                                    PUSH        CSR,CSR+2
    055406  013746  002144                                                           MOV CSR,-(SP)
    055412  013746  002146                                                           MOV CSR+2,-(SP)
686 055416                                  END ;OF ON.ERROR
    055416                                                                  L622:::::::
687 055416                                  IFB R1 EQ #0 THEN LEAVE LCSRSAVE
    055416  105701                                                                     TSTB R1
    055420  001407                                                                     BEQ E112
688 055422                                END ;OF FOR CSRNO
    055422  062737  000004  002256                                                     ADD #4,CSRNO
    055430  023727  002256  000034                                                     CMP CSRNO,#34
    055436  003760                                                                     BLE B113
    055440                                                                  E113:::::::
689 055440                              END LCSRSAVE
    055440                                                                  E112:::::::
690
691 055440                              ;SAVE MMR0,1,2,3
                                        PUSH    MMR0,MMR1,MMR2,MMR3
    055440  013746  177572                                                           MOV MMR0,-(SP)
    055444  013746  177574                                                           MOV MMR1,-(SP)
    055450  013746  177576                                                           MOV MMR2,-(SP)
    055454  013746  172516                                                           MOV MMR3,-(SP)
692
693 055460  012700  172400              ;SAVE KERNEL PAR'S
                                        MOV     #172400,R0
694 055464  012701  000020              MOV     #16.,R1
695 055470                          4$: PUSH    -(R0)
    055470  014046                                                                     MOV -(R0),-(SP)
696 055472  077102                      SOB     R1,4$
697                                     ;SAVE UNIBUS MAP REGISTERS
698 055474                              PUSH    MAPH36,MAPL36,MAPH0,MAPL0
    055474  013746  170372                                                           MOV MAPH36,-(SP)
    055500  013746  170370                                                           MOV MAPL36,-(SP)
```

```
                055504  013746  170202                                          MOV MAPH0,-(SP)
                055510  013746  170200                                          MOV MAPL0,-(SP)
          699                                   ;SAVE POSSIBLE SOFTWARE SWITCH REGISTER
          700 055514                            PUSH    @SWR
                055514  017746  125246                                          MOV @SWR,-(SP)
          701                                   ;SAVE STACK POINTER
          702 055520  010637  056140            MOV     SP,$SAVR6       ;;SAVE SP
          703                                   ;NOW SET UP REAL VECTOR
          704 055524  012737  055536  000024    MOV     #$PWRUP,PWRVEC  ;;SET UP VECTOR
          705 055532  000000            $DOWN:  HALT
          706 055534  000776                    BR      $DOWN           ;;HANG UP
```

```
                        ;*****************************************************************************
                        ;POWER UP ROUTINE
055536                  $PWRUP: IF MULTIPORT IS TRUE THEN JUMPTO MULTIUP
055536 005737 003014                                                        TST MULTIPORT
055542 001402                                                               BEQ L623
055544 000137 056142                                                        JMP MULTIUP
055550                                                              L623:::::::
                        ;RESTORE STACK POINTER
055556 013706 056140            MOV     $SAVR6,SP       ;;GET SP
055562 005037 056140            CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
055566 005237 056140    1$:     INC     $SAVR6          ;;WAIT FOR THE INC
055572 001375                   BNE     1$              ;;OF A WORD
                        ;RESTORE POSSIBLE SOFTWARE SWITCH REGISTER
055574                  POP     @SWR
055574 012677 125166                                                        MOV (SP)+,@SWR
                        ;RESTORE UNIBUS MAP
055600                  POP     MAPL0,MAPH0,MAPL36,MAPH36
055600 012637 170200                                                        MOV (SP)+,MAPL0
055604 012637 170202                                                        MOV (SP)+,MAPH0
055610 012637 170370                                                        MOV (SP)+,MAPL36
055614 012637 170372                                                        MOV (SP)+,MAPH36
055620 004737 042026            CALL    LOWMAP          ;SETUP LOWER 16K OF UNIBUS MAP
                        ;RESTORE KERNEL PAR'S & PDR'S
055624 012700 172340            MOV     #172340,R0
055630 012702 172300            MOV     #KIPDR0,R2
055634 012701 000020            MOV     #16.,R1
055640                  6$:     POP     (R0)+
055640 012620                                                               MOV (SP)+,(R0)+
055642 012722 077406            MOV     #77406,(R2)+
055646 077104                   SOB     R1,6$
                        ;RESTORE MMR3,2,1,0
055650                  POP     MMR3,MMR2,MMR1,MMR0
055650 012637 172516                                                        MOV (SP)+,MMR3
055654 012637 177576                                                        MOV (SP)+,MMR2
055660 012637 177574                                                        MOV (SP)+,MMR1
055664 012637 177572                                                        MOV (SP)+,MMR0
                        ;RESTORE MK11 REGISTERS
055670 013701 002334            MOV     MKCSRS,R1       ;GET CSR'S BYTE
055674 042701 177400            BIC     #177400,R1
                        BEGIN LCSRRESTORE
055700                                                              B114:::::::
                          FOR CSRNO := #34 DOWNTO #0 BY #4
055700 012737 000034 002256                                                 MOV #34,CSRNO
055706                                                              B115:::::::
                            ASRB        R1
                            ON.ERROR
055710 103005                                                               BCC L624
                              POP       CSR+2,CSR
055712 012637 002146                                                        MOV (SP)+,CSR+2
055716 012637 002144                                                        MOV (SP)+,CSR
055722 104425                 LOADCSR
                            END ;OF ON.ERROR
055724                                                              L624:::::::
                            IFB R1 EQ #0 THEN LEAVE LCSRRESTORE
055724 105701                                                               TSTB R1
055726 001407                                                               BEQ E114
```

```
743 055730                               END ;OF FOR CSRNO
    055730 162737 000004 002256                                              SUB #4,CSRNO
    055736 023727 002256 000000                                              CMP CSRNO,#0
    055744 002360                                                            BGE B115
    055746                                                            E115::::::::
744 055746
    055746                               END LCSRRESTORE
745                                                                   E114:::::::
746 055746 012700 172300                 ;COPY KERNEL MAP TO USER & SUPERVISOR
                                         MOV     #KIPDR0,R0
747 055752 012701 177600                 MOV     #UIPDR0,R1
748 055756 012702 172200                 MOV     #SIPDR0,R2
749 055762 012703 000040                 MOV     #32.,R3
750 055766 011021                  3$:   MOV     (R0),(R1)+
751 055770 012022                        MOV     (R0)+,(R2)+
752 055772 077303                        SOB     R3,3$
```

```
754                                             ;RESTORE SUPERVISOR & USER STACK POINTERS
755 055774                                      POP     R0
    055774  012600                                                                  MOV (SP)+,R0
756 055776                                      SUPERVISOR              ;ENTER SUPERVISOR MODE
    055776  052737  040000  177776              BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
757 056004  010006                              MOV     R0,SSP
758 056006  104417                              KERNEL                  ;ENTER KERNEL MODE
759 056010                                      POP     R0
    056010  012600                                                                  MOV (SP)+,R0
760 056012                                      USER
    056012  052737  140000  177776              BIS     #BIT15.BIT14,PSW                ;DO IT TO IT.
                                                .DSABL  CRF
761 056020  010006                              MOV     R0,USP
762 056022  104417                              KERNEL                  ;ENTER KERNEL MODE
763                                             ;RESTORE SUPERVISOR PAR'S
764 056024  012700  172240                      MOV     #172240,R0
765 056030  012701  000020                      MOV     #16.,R1
766 056034                              7$:     POP     (R0)+
    056034  012620                                                                  MOV (SP)+,(R0)+
767 056036  077102                              SOB     R1,7$
768                                             ;RESTORE USER PAR'S & PDR7
769 056040  012700  177636                      MOV     #177636,R0
770 056044  012701  000021                      MOV     #17.,R1
771 056050                              8$:     POP     (R0)+
    056050  012620                                                                  MOV (SP)+,(R0)+
772 056052  077102                              SOB     R1,8$
773                                             ;RESTORE POSSIBLE SOFTWARE DISPLAY REGISTER
774 056054  013777  002014  124706              MOV     $PATMAR,@DISPLAY
775 056062  013737  002014  000174              MOV     $PATMAR,DISPREG
776 056070                                      POP     CSRNO,R5,R4,R3,R2,R1,R0
    056070  012637  002256                                                          MOV (SP)+,CSRNO
    056074  012605                                                                  MOV (SP)+,R5
    056076  012604                                                                  MOV (SP)+,R4
    056100  012603                                                                  MOV (SP)+,R3
    056102  012602                                                                  MOV (SP)+,R2
    056104  012601                                                                  MOV (SP)+,R1
    056106  012600                                                                  MOV (SP)+,R0
777 056110  012737  055160  000024              MOV     #$PWRDN,PWRVEC  ;;SET UP THE POWER DOWN VECTOR
778 056116                                      TYPE    MSG051          ;REPORT THE POWER FAILURE
    056116  104401  114503                      TYPEIT  ,MSG051
                                                .DSABL  CRF
779                                             ;RESTORE MARGIN & CACHE STATUS
780 056122                                      POP     MAINT,CONTRL
    056122  012637  177750                                                          MOV (SP)+,MAINT
    056126  012637  177746                                                          MOV (SP)+,CONTRL
781 056132  000002                              RTI
782 056134  000000                      $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
783 056136  000776                              BR      $ILLUP          ;; BEFORE THE POWER DOWN WAS COMPLETE
784 056140  000000                      $SAVR6: 0                       ;;PUT THE SP HERE
785                                             .EVEN
```

```
                                ;MULTIUP:SUBTST  <<MULTIPLE CPU'S POWERING UP>>
                                ;*****************************************************************
                                ;*SUBTEST        MULTIPLE CPU'S POWERING UP
                                ;*****************************************************************
056142  106237  002760                ASRB    PWLOCK
056146  103002                       BCC     UP2
056150  000000                MULHLT: HALT                    ;BECAUSE I'VE BEEN LOCKED OUT
056152  000776                       BR      MULHLT
056154  000137  004352        UP2:    JMP     START

056160                          WOOPS:  SUBTST  <<POWER FAIL WHILE RELOCATED>>
                                ;*****************************************************************
                                ;*SUBTEST        POWER FAIL WHILE RELOCATED
                                ;*****************************************************************
056160                                  PUSH    BANK
056160  013746  002106                                                    MOV BANK,-(SP)
056164  005037  002106                  CLR     BANK
056170                                  MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
056170  010346                                                            MOV R3,-(SP)
056172  013703  002106                  MOV     BANK,R3
056176  004737  040700                  CALL    MAPPER
                                        .DSABL  CRF
056202  012603                                                            MOV (SP)+,R3
056204                                  SUPERVISOR              ;ENTER SUPERVISOR MODE
056204  052737  040000  177776          BIS     #BIT14,PSW              ;DO IT TO IT
                                        .DSABL  CRF
056212  013737  060024  056542          MOV     FIRST+PWRVEC,WOOPSAV
056220  013737  060026  056544          MOV     FIRST+PWRVEC+2,WOOPSAV+2
056226                                  BMOV    FIRST+WOOPUP,WOOPSAV+4,WOOPEND-WOOPUP/2+12.
056226  004537  043744                      JSR R5,BLOCK3
056232  000102                              WOOPEND-WOOPUP/2+12.
056234  056546                              WOOPSAV+4
056236  136336                              FIRST+WOOPUP
                                            .DSABL      CRF
056240  012737  056336  060024          MOV     #WOOPUP,FIRST+PWRVEC
056246  012737  000340  060026          MOV     #340,FIRST+PWRVEC+2
056254                                  BMOV    WOOPUP,FIRST+WOOPUP,WOOPEND-WOOPUP/2
056254  004537  043744                      JSR R5,BLOCK3
056260  000066                              WOOPEND-WOOPUP/2
056262  136336                              FIRST+WOOPUP
056264  056336                              WOOPUP
                                            .DSABL      CRF
056266  012700  172340                  MOV     #KIPAR0,R0
056272  012701  136512                  MOV     #FIRST+WOOPEND,R1
056276  012702  000010                  MOV     #8.,R2
056302  012021                  1$:     MOV     (R0)+,(R1)+
056304  077202                          SOB     R2,1$
056306  013721  172516                  MOV     MMR3,(R1)+
056312  013721  177576                  MOV     MMR2,(R1)+
056316  013721  177574                  MOV     MMR1,(R1)+
056322  013721  177572                  MOV     MMR0,(R1)+
056326  104417                          KERNEL                  ;ENTER KERNEL MODE
056330                                  POP     BANK
056330  012637  002106                                                    MOV (SP)+,BANK
056334  000207                          RETURN
```

```
R2( 056336                              WOOPUP: SUBTST  <<POWER UP FROM BANK 0 TO RELOCATION>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       POWER UP FROM BANK 0 TO RELOCATION
                                        ;*****************************************************************************
821 056336  012700  056512                      MOV     #WOOPEND,R0
822 056342  012701  172340                      MOV     #KIPAR0,R1
823 056346  012703  172300                      MOV     #KIPDR0,R3
824 056352  012702  000010                      MOV     #8.,R2
825 056356  012021                      1$:     MOV     (R0)+,(R1)+
826 056360  012723  077406                      MOV     #77406,(R3)+
827 056364  077204                              SOB     R2,1$
828 056366  012037  172516                      MOV     (R0)+,MMR3
829 056372  012037  177576                      MOV     (R0)+,MMR2
830 056376  012037  177574                      MOV     (R0)+,MMR1
831 056402  012037  177572                      MOV     (R0)+,MMR0
832 056406  013706  056140                      MOV     $SAVR6,SP
833 056412                                      PUSH    BANK
    056412  013746  002106                                                            MOV BANK,-(SP)
834 056416  005037  002106                      CLR     BANK
835 056422                                      MAP     BANK                    ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
    056422  010346                                                                    MOV R3,-(SP)
    056424  013703  002106                      MOV     BANK,R3
    056430  004737  040700                      CALL    MAPPER
                                                .DSABL  CRF
    056434  012603                                                                    MOV (SP)+,R3
836 056436                                      SUPERVISOR              ;ENTER SUPERVISOR MODE
    056436  052737  040000  177776              BIS     #BIT14,PSW              ;DO IT TO IT.
                                                .DSABL  CRF
837 056444  013737  056542  060024              MOV     WOOPSAV,FIRST+PWRVEC
838 056452  013737  056544  060026              MOV     WOOPSAV+2,FIRST+PWRVEC+2
839                                             ;SIMULATE THE FOLLOWING BLOCK MOV BUT WITH NO STACK ACCESSES
840                                             ;BMOV   WOOPSAV+4,FIRST+WOOPUP,WOOPEND-WOOPUP/2+12.
841 056460  012700  056546                      MOV     #WOOPSAV+4,R0
842 056464  012701  000102                      MOV     #WOOPEND-WOOPUP/2+12.,R1
843 056470  012702  136336                      MOV     #FIRST+WOOPUP,R2
844 056474  012022                      2$:     MOV     (R0)+,(R2)+
845 056476  077102                              SOB     R1,2$
846
847 056500  104417                              KERNEL                  ;ENTER KERNEL MODE
848 056502                                      POP     BANK
    056502  012637  002106                                                            MOV (SP)+,BANK
849 056506  000137  055536                      JMP     $PWRUP
850 056512  000014              WOOPEND:.REPT   12.
853 056542  000104              WOOPSAV:.REPT   WOOPEND-WOOPUP/2+12.+2
```

```
                                        .SBTTL  IO SUBROUTINES

                                        .SBTTL  ROUTINE TYPE

                                ;*******************************************************************************
                                ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                ;*
                                ;*CALL:
                                ;*1) USING A TRAP INSTRUCTION
                                ;*      TYPE    MESADR          ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                ;*OR
                                ;*      TYPE
                                ;*      MESADR
                                ;*

056752  105737  002452          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
056756  100407                          BMI     6$              ;BR IF NO
056760  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
056762  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
056766  112046                  4$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
056770  001005                          BNE     7$              ;;BR IF IT ISN'T THE TERMINATOR
056772  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
056774  012600                  5$:     MOV     (SP)+,R0        ;;RESTORE R0
056776  062716  000002          6$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
057002  000002                          RTI                     ;;RETURN
057004  122716  000011          7$:     CMPB    #HT,(SP)        ;BRANCH IF NOT <HT>
057010  001002                          BNE     11$
057012  112716  000040                  MOVB    #' ,(SP)        ;REPLACE TAB WITH SPACE
057016  122716  000200          11$:    CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
057022  001006                          BNE     8$
057024  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
057026                                  TYPE                    ;;TYPE A CR AND LF
057026  104401                           YPEIT
                                        .DSABL  CRF
057030  003010                          $CRLF
057032  105037  057356                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
057036  000753                          BR      4$              ;;GET NEXT CHARACTER
057040  004737  057076          8$:     CALL    $TYPEC          ;;GO TYPE THIS CHARACTER
057044  123726  003002          9$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
057050  001346                          BNE     4$              ;;IF NO GO GET NEXT CHAR.
057052  013746  002450                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
057056  105366  000001          10$:    DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
057062  002770                          BLT     9$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
057064  004737  057076                  CALL    $TYPEC          ;;GO TYPE A NULL
057070  105337  057356                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
057074  000770                          BR      10$             ;;LOOP
057076                          $TYPEC: PUSH    R1                                              MOV R1,-(SP)
057076  010146
057100  116601  000004                  MOVB    4(SP),R1
057104                                  PUSH    R0,CNTRL                                        MOV R0,-(SP)
057104  010046                                                                                  MOV CNTRL,-(SP)
057106  013746  177746
```

```
    910 057112  104424                          CACHOFF                 ;TURN CACHE OFF
    911 057114                                   IF MULTIPORT IS TRUE
        057114  005737  003014                                                   TST MULTIPORT
        057120  001414                                                           BEQ L625
    912 057122                                     IF NOIIST IS TRUE
        057122  005737  002756                                                   TST NOIIST
        057126  001403                                                           BEQ L626
    913 057130  013700  177764                       MOV SYSTID,R0
    914 057134                                     ELSE
        057134  000406                                                           BR L627
        057136                                                           L626:;;;;;;
    915 057136  017700  123574                       MOV @IISTACR,R0
    916 057142  072027  177770                       ASH #-8.,R0
    917 057146  042700  177774                       BIC #^C3,R0
    918 057152                                     END ;OF IF NOIIST
        057152                                                           L627:;;;;;;
    919 057152                                   END ;OF IF MULTIPORT
        057152                                                           L625:;;;;;;
    920 057152                                   IF PORTDIR NE R0 AND MULTIPORT IS TRUE  ;IF I,M NOT THE MASTER IN A MULTIPORT SYSTEM
        057152  023700  002606                                                   CMP PORTDIR,R0
        057156  001456                                                           BEQ L630
        057160  005737  003014                                                   TST MULTIPORT
        057164  001453                                                           BEQ L630
    921 057166                                     IF CPUBIT EQ #SLAVE1 THEN LET R0 := #2
        057166  023727  002114  000040                                           CMP CPUBIT,#SLAVE1
        057174  001002                                                           BNE L631
        057176  012700  000002                                                   MOV #2,R0
        057202                                                           L631:;;;;;;
    922 057202                                     IF CPUBIT EQ #SLAVE2 THEN LET R0 :  #4
        057202  023727  002114  000100                                           CMP CPUBIT,#SLAVE2
        057210  001002                                                           BNE L632
        057212  012700  000004                                                   MOV #4,R0
        057216                                                           L632:;;;;;;
    923 057216                                     IF CPUBIT EQ #SLAVE3 THEN LET R0 :- #6
        057216  023727  002114  000200                                           CMP CPUBIT,#SLAVE3
        057224  001002                                                           BNE L633
        057226  012700  000006                                                   MOV #6,R0
        057232                                                           L633:;;;;;;
    924 057232                                     MAP   #0                ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK #0
        057232  010346                                                           MOV R3,-(SP)
        057234  012703  000000                   MOV     #0,R3
        057240  004737  040700                   CALL    MAPPER
                                                 .DSABL  CRF
        057244  012603                                                           MOV (SP)+,R3
    925 057246                                     SUPERVISOR              ;ENTER SUPERVISOR MODE
        057246  052737  040000  177776           BIS     #BIT14,PSW              ;DO IT TO IT!
                                                 .DSABL  CRF
    926 057254  005760  062626          2$:        TST   FIRST+PTYFLAG(R0)
    927 057260  100775                             BMI   2$
    928 057262  110160  062636                     MOVB  R1,FIRST+PTYBUF(R0)
    929 057266                                     SET   FIRST+PTYFLAG(R0)
        057266  012760  177777  062626                                           MOV  #-1,FIRST+PTYFLAG(R0)
    930 057274                                     MAP   BANK              ;MAP SUPERVISOR SPACE (TEST AREA) TO BANK
        057274  010346                                                           MOV R3,-(SP)
        057276  013703  002106                   MOV     BANK,R3
        057302  004737  040700                   CALL    MAPPER
                                                 .DSABL  CRF
```

```
        057306  012603                                                                  MOV (SP)+,R3
    931 057310  104417                          KERNEL                  ;ENTER KERNEL MODE
    932 057312                          ELSE                    ;IF I AM THE MASTER OR WE'RE NOT MULTIPORTING
        057312  000405                                                                  BR L634
        057314                                                                  L630:;;;;;;
    933 057314  105777  123456          3$:     TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
    934 057320  100375                          BPL     3$
    935 057322  110177  123452                  MOVB    R1,@$TPB        ;;LOAD CHAR TO BE TYPED INTO DATA REG.
    936 057326                          END ;OF IF PORTDIR
        057326                                                                  L634:;;;;;..
    937 057326  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
    938 057334  001003                          BNE     1$              ;;BRANCH IF NO
    939 057336  105037  057356                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
    940 057342  000406                          BR      $TYPEX          ;;EXIT
    941 057344  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
    942 057352  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
    943 057354  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
    944 057356  000000                  $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
    945 057360                          $TYPEX: POP     CONTRL,R0,R1
        057360  012637  177746                                                          MOV (SP)+,CONTRL
        057364  012600                                                                  MOV (SP)+,R0
        057366  012601                                                                  MOV (SP)+,R1
    946 057370  000207                          RETURN
    947 057372                          SUPLIMIT:;!  . .......THIS IS THE LIMIT ON SUPERVISOR MAPPED TO MUT SPACE
```

```
    949 057372                          MAST01: SUBTST  <<MULTIPORT SLAVE STARTER>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MULTIPORT SLAVE STARTER
                                        ;*****************************************************************************
    950
    951 057372  104424                          .ENABL  LSB
                                                CACHOFF                         ;TURN CACHE OFF
    952 057374                                  SET     NOSCOPE                 ;NO SCOPE LOOPS IN MULTIPROCESSOR TESTS
        057374  012737  177777  002540                                                          MOV  #-1,NOSCOPE
    953 057402  012737  177777  002676          MOV     #-1,MDISPLAY
    954 057410  013777  002676  123352          MOV     MDISPLAY,@DISPLAY
    955                                         ;PASS PSEUDO SWR TO SLAVE
    956 057416  013737  002766  002674          MOV     SWR,MASWR               ;SAVE REAL SWR
    957 057424  012737  000176  002766          MOV     #SWREG,SWR              ;SETUP SOFTWARE SWR
    958 057432  017777  123236  123326          MOV     @MASWR,@SWR             ;FILL IT WITH REAL SWR STUFF
    959 057440                                  IF NOIIST IS TRUE
        057440  005737  002756                                                          TST NOIIST
        057444  001457                                                                  BEQ L635
    960 057446                                    FOR R0 :  #1 TO SLAVES
        057446  012700  000001                                                          MOV #1,R0
        057452                                                                  B116:;;;;;;
    961 057452  005037  002670                      CLR LOCK
    962 057456  162737  000200  002706              SUB #200,KSTACK
    963 057464  010001                              MOV R0,R1
    964 057466  006301                              ASL R1
    965 057470                                      FOR R2 := #10. DOWNTO #0
        057470  012702  000012                                                          MOV #10.,R2
        057474                                                                  B117:;;;;;;
    966 057474  010261  002636                        MOV       R2,PTYBUF(R1)
    967 057500  012703  000200                        MOV       #200,R3 ;DELAY FOR THE SLAVE TO GAIN ACCESS TO CNT-DOWN
    968 057504  077301                      1$:       SOB       R3,1$
    969 057506                                      END ;OF FOR R2
        057506  005302                                                                  DEC R2
        057510  020227  000000                                                          CMP R2,#0
        057514  002367                                                                  BGE B117
        057516                                                                  E117:;;;;;;;
    970 057516  012703  000200                      MOV #200,R3 ;DELAY FOR THE SLAVE TO SETUP HIS STACK
    971 057522  077301                      2$:     SOB R3,2$
    972 057524  012737  023542  002574              MOV #2*SECONDS,HUNGTIME
    973 057532  004737  072154              4$:     CALL        QUE
    974 057536                                      ON.ERROR
        057536  103012                                                                  BCC L636
    975 057540  010037  002056                        MOV       R0,BAD
    976 057544  104060                                ERROR     +60             ;SLAVE HUNG SYSTEM!
    977 057546  005037  003014                        CLR       MULTIPORT
    978 057552  012737  002000  002706              MOV       #STACK,KSTACK
    979 057560  000137  060746                        JMP       MULTIEXIT
    980 057564                                      END ;OF ON.ERROR
        057564                                                                  L636:;;;;;;
    981 057564  005761  002616                      TST TASK(R1)
    982 057570  100360                              BPL 4$
    983 057572                                    END ;OF FOR R0
        057572  005200                                                                  INC R0
        057574  020037  002730                                                          CMP R0,SLAVES
        057600  003724                                                                  BLE B116
        057602                                                                  E116:;;;;;;;
    984 057602                                  ELSE
        057602  000516                                                                  BR L637
```

```
057604                                                                          L635:;;;;;;
057604  013700  002742                       MOV    IISTVEC,R0
057610  012720  061216                       MOV    #SLAVUP,(R0)+
057614  012710  000340                       MOV    #340,(R0)
057620                                       FOR R0 := #0 TO #3
057620  005000                                                                        CLR R0
057622                                                                          B120:;;;;;;
057622  005037  002670                         CLR LOCK
057626  162737  000200  002706                 SUB #200,KSTACK
057634  012701  000001                         MOV #1,R1
057640  072100                                 ASH R0,R1
057642  004737  061174                         CALL          IISTOFF          ;INIT IIST & DISABLE BOOTS & INTERRUPTS
057646  012777  000000  123062                 MOV #0,@IISTACR
057654  010177  123060                         MOV R1,@IISTADR     ;INTERRUPT SOME CPU
057660  012777  000001  127052                 MOV #1,@IISTADR     ;NOW.


                                               ;WAIT FOR READY FLAG
057666  012737  061165  002574                 MOV #5*SECONDS,HUNGTIME
057674  012777  000001  123034   6$:           MOV #1,@IISTACR
057702                                         ON.ERROR
057702  103010                                                                        BCC L640
057704  104061                                   ERROR       +61              ;IIST HUNG SYSTEM.
057706  005037  003014                           CLR         MULTIPORT
057712  012737  002000  002706                   MOV         #STACK,KSTACK
057720  000137  060746                           JMP         MULTIEXIT
057724                                         END ;OF ON.ERROR
057724                                                                          L640:;;;;;;
057[illegible]24  032777  004000  123006               BIT #BI111,@IISTADR
05[illegible]2  001760                                 BEQ 6$
057734  012703  000200                         MOV #200,R3 ;DELAY FOR THE IIST TO REALLY BE READY
057740  077301                   3$:           SOB R3,3$    ;AND FOR SLAVE TO GO THRU VECTOR AND SETUP HIS STACK
057742                                       END ;OF FOR R0
057742  005200                                                                        INC R0
057744  020027  000003                                                                CMP R0,#3
057750  003724                                                                        BLE B120
057752                                                                          E120:;;;;;;;
057752                                       FOR R0 :  #1 TO SLAVES
057752  012700  000001                                                                MOV #1,R0
057756                                                                          B121:;;;;;;
057756  010001                                 MOV R0,R1
057760  006301                                 ASL R1
057762  012737  061165  002574                 MOV #5*SECONDS,HUNGTIME
057770  004737  072154           5$:           CALL          QUE
057774                                         ON.ERROR
057774  103012                                                                        BCC L641
057776  010037  002056                           MOV         R0,BAD
060002  104060                                   ERROR       +60              ;SLAVE HUNG SYSTEM!
060004  005037  003014                           CLR         MULTIPORT
060010  012737  002000  002706                   MOV         #STACK,KSTACK
060016  000137  060746                           JMP         MULTIEXIT
060022                                         END ;OF ON.ERROR
060022                                                                          L641:;;;;;;
060022  005761  002616                         TST TASK(R1)
060026  100360                                 BPL 5$
060030                                       END ;OF FOR R0
060030  005200                                                                        INC R0
060032  020037  002730                                                                CMP R0,SLAVES
```

```
        060036  003747                                                  BLE B121
        060040                                                        E121:::::::
   1027 060040                          END ;OF IF NOIIST
        060040                                                        L637::::::
   1028 060040  012737  002000  002706  MOV     #STACK,KSTACK
   1029                                 .DSABL  LSB
```

```
1032 060046                          MAST02: SUBTST  <<HAVE SLAVES RUN CSR TESTS>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       HAVE SLAVES RUN CSR TESTS
                                     ;*****************************************************************************
1033
1034 060046  012737  000000  002676          MOV     #0,@DISPLAY     ;LET SLAVES SHOW INDIVIDUAL CSR TESTS IN DISPLAY
1035 060054  012777  177776  122706          MOV     #-2,@DISPLAY    ;FAKE OUT MASTER'S DISPLAY (NOT SLAVES)
1036 060062  005037  002670                  CLR     LOCK
1037 060066                                  FOR R0 := #1 TO SLAVES
     060066  012700  000001                                                          MOV #1,R0
     060072                                                                  B122:::::::
1038 060072  012701  000020                    MOV   #BIT4,R1
1039 060076  072100                            ASH   R0,R1
1040 060100  010137  002114                    MOV   R1,CPUBIT
1041 060104  010001                            MOV   R0,R1
1042 060106  006301                            ASL   R1
1043 060110  012761  000015  002616            MOV   #15.,TASK(R1)             ;RUN CSR TESTS COMMAND
1044 060116  012737  000031  002572            MOV   #25.,HUNGMSB
1045 060124  012737  177777  002574            MOV   #-1,HUNGTIME              ;13 SECONDS
1046 060132  004737  072154          1$:       CALL  QUE
1047 060136                                    ON.ERROR
     060136  103016                                                                BCC L642
1048 060140  162737  000001  002572              SUB #1,HUNGMSB
1049 060146                                      ON.ERROR
     060146  103012                                                                BCC L643
1050 060150  010037  002056                        MOV       R0,BAD
1051 060154  012737  000020  002114                MOV       #MASTER,CPUBIT
1052 060162  104060                              ERROR     +60                   ;SLAVE HUNG SYSTEM!
1053 060164  005037  003014                      CLR       MULTIPORT
1054 060170  000137  060746                      JMP       MULTIEXIT
1055 060174                                    END ;OF ON.ERROR
     060174                                                                  L643:::::::
1056 060174                                  END ;OF ON.ERROR
     060174                                                                  L642:::::::
1057 060174  005761  002616                    TST   TASK(R1)
1058 060200  100354                            BPL   1$
1059 060202                                  END ;OF FOR R0
     060202  005200                                                                INC R0
     060204  020037  002730                                                        CMP R0,SLAVES
     060210  003730                                                                BLE B122
     060212                                                                  E122:::::::
1060 060212  012737  000020  002114          MOV     #MASTER,CPUBIT          ;SET UP AS MASTER AGAIN
1061                                         .DSABL  LSB
```

HAVE SLAVES RUN CSR TESTS

```
1064 060220                        MAST03: SUBTST  <<MOVE SLAVES TO THERE OWN BANKS>>
                                   ;*****************************************************************
                                   ;*SUBTEST       MOVE SLAVES TO THERE OWN BANKS
                                   ;*****************************************************************
1065
1066 060220  012737  177775  002676          .ENABL  LSB
1067 060226  013777  002676  122534          MOV     #-3,@DISPLAY
1068 060234  005037  002670                  MOV     @DISPLAY,@DISPLAY
1069 060240                                  CLR     LOCK
                                             FOR R0 := #1 TO SLAVES
     060240  012700  000001                                                      MOV #1,R0
     060244                                                                  B123:::::::
1070 060244  012701  000020                    MOV   #BIT4,R1
1071 060250  072100                            ASH   R0,R1
1072 060252  010137  002114                    MOV   R1,CPUBIT
1073 060256                                    BEGIN MOVELOOP
     060256                                                                  B124:::::::
1074 060256                                      FOR BANK := #0 TO #167
     060256  012737  000001  002106                                                  MOV #1,BANK
     060264                                                                  B125:::::::
1075 060264  004737  042422                        CALL EXBANK
1076 060270                                        IF PFLAG IS FALSE AND ACFLAG IS TRUE AND BMFLAG IS FALSE
     060270  005737  002130                                                        TST PFLAG
     060274  001050                                                              BNE L644
     060276  005737  002124                                                      TST ACFLAG
     060302  001445                                                              BEQ L644
     060304  005737  002136                                                      TST BMFLAG
     060310  001042                                                              BNE L644
1077 060312  104511                                INVALIDATE
1078 060314  010001                                MOV     R0,R1
1079 060316  006301                                ASL     R1                  ;R1   2 OR 4 OR 6
1080 060320  012761  000001  002616                MOV     #1,TASK(R1)         ;MOVE COMMAND
1081 060326  012737  061165  002574                MOV     #5*SECONDS,HUNGTIME
1082 060334  004737  072154          1$:           CALL    QUE
1083 060340                                        ON.ERROR
     060340  103012                                                                BCC L645
1084 060342  010037  002056                          MOV   R0,BAD
1085 060346  012737  000020  002114                  MOV   #MASTER,CPUBIT
1086 060354  104060                                  ERROR +60                 ;SLAVE HUNG SYSTEM!
1087 060356  005037  003014                          CLR   MULTIPORT
1088 060362  000137  060746                          JMP   MULTIEXIT
1089 060366                                        END ;OF ON.ERROR
     060366                                                                  L645:::::::
1090 060366  005761  002616                        TST     TASK(R1)
1091 060372  100360                                BPL     1$
1092 060374  013701  002110                        MOV     BANKINDEX,R1
1093 060400  052761  100000  003016                BIS     #BIT15,CONFIG(R1)
1094 060406  042761  020000  003020                BIC     #BIT13,CONFIG+2(R1)     ;INVALIDATE BACKGROUND PATTERN
1095 060414                                        LEAVE MOVELOOP
     060414  000415                                                                BR E124
1096 060416                                      END ;OF IF PFLAG
     060416                                                                  L644:::::::
1097 060416                                    END ;OF FOR BANK
     060416  005237  002106                                                        INC BANK
     060422  023727  002106  000167                                              CMP BANK,#167
     060430  003715                                                              BLE B125
     060432                                                                  E125:::::::
1098 060432  010037  002056                    MOV R0,BAD
```

```
1099 060436  104062                          ERROR       +62             ;NOT ENOUGH GOOD MEMORY TO TEST SLAVES
1100                                                                     ;ABORTING MULTIPROCESSOR TESTS
1101 060440  005037  003014                    CLR MULTIPORT
1102 060444  000137  060746                    JMP MULTIEXIT
1103 060450                                  END MOVELOOP
     060450                                                                      E124::::::
1104 060450                                END ;OF FOR R0
     060450  005200                                                                INC R0
     060452  020037  002730                                                       CMP R0,SLAVES
     060456  003672                                                              BLE B123
     060460                                                                      E123::::::::
1105 060460  012737  002000  002706          MOV     #STACK,KSTACK
1106                                       ;POINT THE MASTER BACK TO THE NORMAL SWR
1107 060466  013737  002674  002766          MOV     MASWR,SWR
1108                                       .DSABL  LSB
```

```
1111 060474                            SUBTST  <<RUN NORMAL MULTIPROCESSOR TESTS>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       RUN NORMAL MULTIPROCESSOR TESTS
                                       ;*****************************************************************************
1112 060474  012737  000020  002114          MOV     #MASTER,CPUBIT
1113 060502  052737  000020  002510          BIS     #BIT4,ALLCPUS
1114 060510                                  FOR R0 .- #1 TO SLAVES
     060510  012700  000001                                                  MOV #1,R0
     060514                                                              B126:::::::
1115 060514  006337  002510                    ASL   ALLCPUS
1116 060520  052737  000020  002510            BIS   #BIT4,ALLCPUS
1117 060526                                  END ;OF FOR R0
     060526  005200                                                         INC R0
     060530  020037  002730                                                 CMP R0,SLAVES
     060534  003767                                                         BLE B126
     060536                                                              E126:::::::
1118 060536  004737  061322                  CALL    MAST04          ;ACCESS PATHS TEST
1119 060542                                  ON.ERROR
     060542  103004                                                         BCC L646
1120 060544  005037  003014                    CLR   MULTIPORT
1121 060550  000137  060746                    JMP   MULTIEXIT
1122 060554                                  END ;OF ON.ERROR
     060554                                                              L646:::::::
1123 060554  004737  061706                  CALL    MAST05          ;ADDRESS TEST
1124 060560                                  ON.ERROR
     060560  103004                                                         BCC L647
1125 060562  005037  003014                    CLR   MULTIPORT
1126 060566  000137  060746                    JMP   MULTIEXIT
1127 060572                                  END ;OF ON.ERROR
     060572                                                              L647:::::::
1128 060572  004737  062270                  CALL    MAST06          ;ASYCHRONOUS ADDRESS UNIQUENESS TEST
1129 060576                                  ON.ERROR
     060576  103004                                                         BCC L650
1130 060600  005037  003014                    CLR   MULTIPORT
1131 060604  000137  060746                    JMP   MULTIEXIT
1132 060610                                  END ;OF ON.ERROR
     060610                                                              L650:::::::
1133 060610  004737  062550                  CALL    MAST07          ;SKEWED UP ADDRESS TEST
1134 060614                                  ON.ERROR
     060614  103004                                                         BCC L651
1135 060616  005037  003014                    CLR   MULTIPORT
1136 060622  000137  060746                    JMP   MULTIEXIT
1137 060626                                  END ;OF ON.ERROR
     060626                                                              L651:::::::
1138 060626  004737  062776                  CALL    MAST10          ;PORT ARBITRATION SYMMETRY TEST
1139 060632                                  ON.ERROR
     060632  103004                                                         BCC L652
1140 060634  005037  003014                    CLR   MULTIPORT
1141 060640  000137  060746                    JMP   MULTIEXIT
1142 060644                                  END ;OF ON.ERROR
     060644                                                              L652:::::::
1143 060644  004737  063260                  CALL    MAST11          ;I/O PRIORITY TEST
1144 060650                                  ON.ERROR
     060650  103004                                                         BCC L653
1145 060652  005037  003014                    CLR   MULTIPORT
1146 060656  000137  060746                    JMP   MULTIEXIT
1147 060662                                  END ;OF ON.ERROR
```

```
                                                                                L653::::::
1148 060662 004737 063732                CALL    MAST12          ;EXECUTION CONTENTION TEST
1149 060666                              ON.ERROR
     060666 103004                                                              BCC L654
1150 060670 005037 003014                  CLR   MULTIPORT
1151 060674 000137 060746                  JMP   MULTIEXIT
1152 060700                              END ;OF ON.ERROR
     060700                                                                     L654::::::
1153 060700 004737 064200                CALL    MAST13          ;ASRB TEST
1154 060704                              ON.ERROR
     060704 103004                                                              BCC L655
1155 060706 005037 003014                  CLR   MULTIPORT
1156 060712 000137 060746                  JMP   MULTIEXIT
1157 060716                              END ;OF ON.ERROR
     060716                                                                     L655::::::
1158 060716 004737 064204                CALL    MAST14          ;CACHE FLUSH TEST
1159 060722                              ON.ERROR
     060722 103004                                                              BCC L656
1160 060724 005037 003014                  CLR   MULTIPORT
1161 060730 000137 060746                  JMP   MULTIEXIT
1162 060734                              END ;OF ON.ERROR
     060734                                                                     L656::::::
1163 060734 004737 064472                CALL    MAST15          ;STOP SLAVES
1164 060740                              ON.ERROR
     060740 103002                                                              BCC L657
1165 060742 005037 003014                  CLR   MULTIPORT
1166 060746                              END ;OF ON.ERROR
     060746                                                                     L657::::::
1167 060746                      MULTIEXIT:FOR BANK := #1 TO #167
     060746 012737 000001 002106                                                MOV #1,BANK
     060754                                                                     B127::::::
1168 060754 004737 042422                  CALL  EXBANK
1169 060760 013701 002110                  MOV   BANKINDEX,R1
1170 060764 042761 100000 003016           BIC   #BIT15,CONFIG(R1)
1171 060772                              END ;OF FOR BANK
     060772 005237 002106                                                       INC BANK
     060776 023727 002106 000167                                                CMP BANK,#167
     061004 003763                                                              BLE B127
     061006                                                                     E127::::::
1172
1173                                     ;MARK THE LOADERS AS PROTECTED AGAIN
1174 061006 013737 002710 002106         MOV     LOADHOME,BANK
1175 061014 004737 042422                CALL    EXBANK
1176 061020 013701 002110                MOV     BANKINDEX,R1
1177 061024 052761 100000 003016         BIS     #BIT15,CONFIG(R1)
1178
1179 061032 005037 002676                CLR     MDISPLAY
1180 061036 005077 121726                CLR     @DISPLAY
1181 061042                              SET     WRITEONLY
     061042 012737 177777 002502                                                MOV  #-1,WRITEONLY
1182 061050 004737 015104                CALL    DOBACK          ;REWRITE BACKGROUND PATTERN
1183 061054                              CLEAR   NOSCOPE,LOCK,WRITEONLY
     061054 005037 002540                                                       CLR  NOSCOPE
     061060 005037 002670                                                       CLR  LOCK
     061064 005037 002502                                                       CLR  WRITEONLY
1184 061070 000137 014656                JMP     FLUSH
```

```
1187 061074                            IISTINIT:SUBTST <<INITIALIZE THE IIST>>
                                       ;*************************************************************************
                                       ;*SUBTEST       INITIALIZE THE IIST
                                       ;*************************************************************************
1188
1189 061074  012777  100000  121634            .ENABL  LSB
1190 061102  012777  000005  121626            MOV     #BIT15,@IISTACR
1191 061110  013777  002726  121622            MOV     #5,@IISTACR
1192 061116  013777  002726  121614            MOV     ONES,@IISTADR
1193 061124  012737  061165  002574            MOV     ONES,@IISTADR
1194 061132  012777  000001  121576  2$:       MOV     #5*SECONDS,HUNGTIME
1195 061140                                    MOV     #1,@IISTACR
     061140  023727  002114  000020            IF CPUBIT EQ #MASTER                    CMP CPUBIT,#MASTER
     061146  001005                                                                    BNE L660
1196 061150                                      ON.ERROR
     061150  103004                                                                    BCC L661
1197 061152  104061                                ERROR       +61                   ;IIST HUNG SYSTEM
1198 061154  005037  003014                        CLR MULTIPORT
1199 061160  000207                                RETURN
1200 061162                                      END ;OF ON.ERROR
     061162                                                                         L661:;;;;;;
1201 061162                                    END ;OF IF CPUBIT
     061162                                                                         L660:;;;;;;
1202 061162  032777  004000  121550            BIT     #BIT11,@IISTADR
1203 061170  001760                            BEQ     2$
1204 061172  000207                            RETURN
1205                                           .DSABL  LSB
1206
1207 061174                            IISTOFF:SUBTST  <<INIT IIST & DISABLE BOOTS & INTERRUPTS>>
                                       ;*************************************************************************
                                       ;*SUBTEST       INIT IIST & DISABLE BOOTS & INTERRUPTS
                                       ;*************************************************************************
1208 061174  004737  061074                    CALL    IISTINIT
1209 061200  012777  000004  121530            MOV     #4,@IISTACR
1210 061206  013777  002726  121524            MOV     ONES,@IISTADR
1211 061214  000207                            RETURN
1212
1213 061216  013706  002706            SLAVJP: MOV     KSTACK,SP
1214 061222  004737  061244                    CALL    SLAVEMAP
1215 061226  104420                            ENERGIZE                ;TURN ON MEMORY MANAGEMENT
1216 061230  000237                            SPL     7
1217 061232  052763  100000  002616            BIS     #BIT15,TASK(R3)
1218 061240  000137  050726                    JMP     TASKDO
```

```
1221' 061244                            SLAVEMAP:SUBTST <<SLAVES MAP>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SLAVES MAP
                                        ;*****************************************************************************
1222
1223 061244  104415                             ;MAP KERNEL
                                        SAVREG
1224 061246  012700  002550             MOV     #KI0,R0
1225 061252  012701  172340             MOV     #KIPAR0,R1
1226 061256  012702  077406             MOV     #77406,R2
1227 061262  012703  172300             MOV     #KIPDR0,R3
1228 061266  012705  000006             MOV     #6,R5
1229 061272  012021                 1$: MOV     (R0)+,(R1)+
1230 061274  010223                     MOV     R2,(R3)+
1231 061276  077503                     SOB     R5,1$
1232 061300  012721  177400             MOV     #177400,(R1)+
1233 061304  010223                     MOV     R2,(R3)+
1234 061306  012711  177600             MOV     #177600,(R1)
1235 061312  010213                     MOV     R2,(R3)
1236 061314  104420                     ENERGIZE
1237 061316  104416                     RESREG
1238 061320  000207                     RETURN
```

```
 1241 061322                            MAST04: SUBTST  <<MULTIPORT ACCESS PATHS TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MULTIPORT ACCESS PATHS TEST
                                        ;*****************************************************************************
 1242
 1243 061322  012737  177774  002676           .ENABL  LSB
 1244 061330  013777  002676  121432           MOV     #-4,MDISPLAY
 1245 061336                                   MOV     MDISPLAY,@DISPLAY
                                               FOR R0 := #0 TO SLAVES
      061336  005000                                                                    CLR R0
      061340                                                                  B130:;;;;;;
 1246 061340  010001                             MOV   R0,R1
 1247 061342  006301                             ASL   R1
 1248 061344                                     FOR BANK := #1 TO #167
      061344  012737  000001  002106                                                    MOV #1,BANK
      061352                                                                  B131:;;;;;;
 1249 061352  013737  002510  002114               MOV ALLCPUS,CPUBIT
 1250 061360  004737  042422                       CALL        EXBANK
 1251 061364  012737  000020  002114               MOV #MASTER,CPUBIT
 1252 061372                                       IF PFLAG IS FALSE AND ACFLAG IS TRUE
      061372  005737  002130                                                          TST PFLAG
      061376  001127                                                                 BNE L662
      061400  005737  002124                                                          TST ACFLAG
      061404  001524                                                                 BEQ L662
 1253 061406  104511                               INVALIDATE
 1254 061410                                       FOR R5 := #0 TO #5 ;FOR PATTERNS 0-5
      061410  005005                                                                 CLR R5
      061412                                                                  B132:;;;;;;
 1255 061412  010502                               MOV     R5,R2
 1256 061414  000302                               SWAB    R2
 1257 061416  062702  000002                       ADD     #2,R2           ;WRITE ONLY PATTERN COMMAND
 1258 061422  010261  002616                       MOV     R2,TASK(R1)     ;SET TASK ORDER
 1259 061426                                       IF R1 EQ #0
      061426  005701                                                                 TST R1
      061430  001012                                                                 BNE L663
 1260 061432                                         PUSH  R0,R1,R2,R5
      061432  010046                                                                 MOV R0,-(SP)
      061434  010146                                                                 MOV R1,-(SP)
      061436  010246                                                                 MOV R2,-(SP)
      061440  010546                                                                 MOV R5,-(SP)
 1261 061442  004737  050726                         CALL  TASKDO
 1262 061446                                         POP   R5,R2,R1,R0
      061446  012605                                                                 MOV (SP)+,R5
      061450  012602                                                                 MOV (SP)+,R2
      061452  012601                                                                 MOV (SP)+,R1
      061454  012600                                                                 MOV (SP)+,R0
 1263 061456                                       END ;OF IF R1
      061456                                                                  L663:;;;;;;
 1264 061456  012737  061165  002574               MOV     #5*SECONDS,HUNGTIME
 1265 061464  004737  072154           1$:         CALL    QUE
 1266 061470                                       ON.ERROR
      061470  103005                                                                 BCC L664
 1267 061472  010037  002056                         MOV   R0,BAD
 1268 061476  104060                               ERROR +60                 ;SLAVE HUNG SYSTEM.
 1269 061500                                       $RETURN ERROR
      061500  000261                                                                 SEC
      061502  000207                                                                 RTS PC
 1270 061504                                       END ;OF ON.ERROR
```

```
                061504
1271 061504 005761 002616                       TST     TASK(R1)
1272 061510 100365                              BPL     1$
1273 061512 062702 000001                       ADD     #1,R2           ;CHANGE ORDER TO READ ONLY
1274 061516                                     FOR R3 :- #0 TO SLAVES
     061516 005003                                                              CLR R3
     061520                                                             B133:::::::
1275 061520 010304                                MOV   R3,R4
1276 061522 006304                                ASL   R4
1277 061524 010264 002616                         MOV   R2,TASK(R4)
1278 061530                                     END ;OF FOR R3
     061530 005203                                                              INC R3
     061532 020337 002730                                                       CMP R3,SLAVES
     061536 003770                                                              BLE B133
     061540                                                             E133:::::::
1279 061540                                     PUSH    R0,R1,R3,R4,R5
     061540 010046                                                              MOV R0,-(SP)
     061542 010146                                                              MOV R1,-(SP)
     061544 010346                                                              MOV R3,-(SP)
     061546 010446                                                              MOV R4,-(SP)
     061550 010546                                                              MOV R5,-(SP)
1280 061552 004737 050726                       CALL    TASKDO
1281 061556                                     POP     R5,R4,R3,R1,R0
     061556 012605                                                              MOV (SP)+,R5
     061560 012604                                                              MOV (SP)+,R4
     061562 012603                                                              MOV (SP)+,R3
     061564 012601                                                              MOV (SP)+,R1
     061566 012600                                                              MOV (SP)+,R0
1282 061570                                     FOR R3 := #0 TO SLAVES
     061570 005003                                                              CLR R3
     061572                                                             B134:::::::
1283 061572 010304                                MOV   R3,R4
1284 061574 006304                                ASL   R4
1285 061576                                       IF R4 NE R1
     061576 020401                                                              CMP R4,R1
     061600 001416                                                              BEQ L665
1286 061602 012737 061165 002574                    MOV #5*SECONDS,HUNGTIME
1287 061610 004737 072154           2$:             CALL        QUE
1288 061614                                         ON.ERROR
     061614 103005                                                              BCC L666
1289 061616 010337 002056                             MOV       R3,BAD
1290 061622 104060                                    ERROR     +60             ;SLAVE HUNG SYSTEM!
1291 061624                                           $RETURN ERROR
     061624 000261                                                              SEC
     061626 000207                                                              RTS PC
1292 061630                                         END ;OF ON.ERROR
     061630                                                             L666:::::::
1293 061630 005764 002616                           TST TASK(R4)
1294 061634 100365                                  BPL 2$
1295 061636                                       END ;OF IF R4
     061636                                                             L665:::::::
1296 061636                                     END ;OF FOR R3
     061636 005203                                                              INC R3
     061640 020337 002730                                                       CMP R3,SLAVES
     061644 003752                                                              BLE B134
     061646                                                             E134:::::::
1297 061646                                   END ;OF FOR R5
```

```
        061646  005205                                                          INC R5
        061650  020527  000005                                                  CMP R5,#5
        061654  003656                                                          BLE B132
        061656                                                          E132:::::::
  1298  061656                                  END ;OF IF PFLAG
        061656                                                          L662:::::::
  1299  061656                                END ;OF FOR BANK
        061656  005237  002106                                                  INC BANK
        061662  023727  002106  000167                                         CMP BANK,#167
        061670  003630                                                          BLE B131
        061672                                                          E131:::::::
  1300  061672                              END ;OF FOR R0
        061672  005200                                                          INC R0
        061674  020037  002730                                                  CMP R0,SLAVES
        061700  003617                                                          BLE B130
        061702                                                          E130:::::::
  1301  061702                              $RETURN NOERROR
        061702  000241                                                          CLC
        061704  000207                                                          RTS PC
  1302                                      .DSABL  LSB
```

```
1306 061706                          MAST05: SUBTST  <<MULTIPORT ADDRESS TEST>>
                                     ;*****************************************************************************
                                     ;*SUBTEST       MULTIPORT ADDRESS TEST
                                     ;*****************************************************************************
1307                                         .ENABL  LSB
1308 061706  012737  177773  002676         MOV     #-5,@DISPLAY
1309 061714  013777  002676  121046         MOV     @DISPLAY,@DISPLAY
1310 061722                                  FOR R0 := #0 TO SLAVES
     061722  005000                                                          CLR R0
     061724                                                          B135:::::::
1311 061724  010001                            MOV   R0,R1
1312 061726  006301                            ASL   R1
1313 061730                                    FOR BANK :  #1 TO #167
     061730  012737  000001  002106                                         MOV #1,BANK
     061736                                                          B136:::::::
1314 061736  013737  002510  002114              MOV ALLCPUS,CPUBIT
1315 061744  004737  042422                      CALL        EXBANK
1316 061750  012737  000020  002114              MOV #MASTER,CPUBIT
1317 061756                                      IF PFLAG IS FALSE AND ACFLAG IS TRUE
     061756  005737  002130                                                 TST PFLAG
     061762  001126                                                         BNE L667
     061764  005737  002124                                                 TST ACFLAG
     061770  001523                                                         BEQ L667
1318 061772                                        FOR R5 := #0 TO #1 ;FOR ADDRESS & COMPLEMENT ADDRESS PATTERNS
     061772  005005                                                         CLR R5
     061774                                                          B137:::::::
1319 061774  010502                              MOV     R5,R2
1320 061776  000302                              SWAB    R2
1321 062000  062702  000007                      ADD     #7,R2           ;WRITE ONLY ADDRESS PATTERN
1322 062004  010261  002616                      MOV     R2,TASK(R1)     ;SET TASK ORDER
1323 062010                                      IF R1 EQ #0
     062010  005701                                                         TST R1
     062012  001012                                                         BNE L670
1324 062014                                        PUSH  R0,R1,R2,R5
     062014  010046                                                         MOV R0,-(SP)
     062016  010146                                                         MOV R1,-(SP)
     062020  010246                                                         MOV R2,-(SP)
     062022  010546                                                         MOV R5,-(SP)
1325 062024  004737  050726                        CALL  TASKDO
1326 062030                                        POP   R5,R2,R1,R0
     062030  012605                                                         MOV (SP)+,R5
     062032  012602                                                         MOV (SP)+,R2
     062034  012601                                                         MOV (SP)+,R1
     062036  012600                                                         MOV (SP)+,R0
1327 062040                                      END ;OF IF R1
     062040                                                          L670:::::::
1328 062040  012737  061165  002574              MOV     #5*SECONDS,HUNGTIME
1329 062046  004737  072154          1$:         CALL    QUE
1330 062052                                      ON.ERROR
     062052  103005                                                         BCC L671
1331 062054  010037  002056                        MOV   R0,BAD
1332 062060  104060                              ERROR +60                 ;SLAVE HUNG SYSTEM!
1333 062062                                      $RETURN ERROR
     062062  000261                                                         SEC
     062064  000207                                                         RTS PC
1334 062066                                      END ;OF ON.ERROR
     062066                                                          L671:::::::
```

```
1335 062066  005761  002616                    TST     TASK(R1)
1336 062072  100365                            BPL     1$
1337 062074  062702  000001                    ADD     #1,R2           ;CHANGE ORDER TO READ ADDRESS PATTERNS ONLY
1338 062100                                    FOR R3 := #0 TO SLAVES
     062100  005003                                                            CLR R3
     062102                                                                B140:::::::
1339 062102  010304                              MOV   R3,R4
1340 062104  006304                              ASL   R4
1341 062106  010264  002616                      MOV   R2,TASK(R4)
1342 062112                                    END ;OF FOR R3
     062112  005203                                                            INC R3
     062114  020337  002730                                                    CMP R3,SLAVES
     062120  003770                                                            BLE B140
     062122                                                                E140:::::::
1343 062122                                    PUSH    R0,R1,R3,R4,R5
     062122  010046                                                            MOV R0,-(SP)
     062124  010146                                                            MOV R1,-(SP)
     062126  010346                                                            MOV R3,-(SP)
     062130  010446                                                            MOV R4,-(SP)
     062132  010546                                                            MOV R5,-(SP)
1344 062134  004737  050726                    CALL    TASKDO
1345 062140                                    POP     R5,R4,R3,R1,R0
     062140  012605                                                            MOV (SP)+,R5
     062142  012604                                                            MOV (SP)+,R4
     062144  012603                                                            MOV (SP)+,R3
     062146  012601                                                            MOV (SP)+,R1
     062150  012600                                                            MOV (SP)+,R0
1346 062152                                    FOR R3 := #0 TO SLAVES
     062152  005003                                                            CLR R3
     062154                                                                B141:::::::
1347 062154  010304                              MOV   R3,R4
1348 062156  006304                              ASL   R4
1349 062160                                      IF R4 NE R1
     062160  020401                                                            CMP R4,R1
     062162  001416                                                            BEQ L672
1350 062164  012737  061165  002574                MOV #5*SECONDS,HUNGTIME
1351 062172  004737  072154          2$:           CALL        QUE
1352 062176                                      ON.ERROR
     062176  103005                                                            BCC L673
1353 062200  010337  002056                        MOV       R3,BAD
1354 062204  104060                              ERROR     +60                 ;SLAVE HUNG SYSTEM!
1355 062206                                       $RETURN ERROR
     062206  000261                                                            SEC
     062210  000207                                                            RTS PC
1356 062212                                      END ;OF ON.ERROR
     062212                                                                L673:::::::
1357 062212  005764  002616                      TST TASK(R4)
1358 062216  100365                              BPL 2$
1359 062220                                    END ;OF IF R4
     062220                                                                L672:::::::
1360 062220                                    END ;OF FOR R3
     062220  005203                                                            INC R3
     062222  020337  002730                                                    CMP R3,SLAVES
     062226  003752                                                            BLE B141
     062230                                                                E141:::::::
1361 062230                                  END ;OF FOR R5
     062230  005205                                                            INC R5
```

```
        062232  020527  000001                                          CMP R5,#1
        062236  003656                                                  BLE B137
        062240                                                  E137:::::::
  1362  062240                          END ;OF IF PFLAG
        062240                                                  L667:::::::
  1363  062240                        END ;OF FOR BANK
        062240  005237  002106                                          INC BANK
        062244  023727  002106  000167                                  CMP BANK,#167
        062252  003631                                                  BLE B136
        062254                                                  E136:::::::
  1364  062254                      END ;OF FOR R0
        062254  005200                                                  INC R0
        062256  020037  002730                                          CMP R0,SLAVES
        062262  003620                                                  BLE B135
        062264                                                  E135:::::::
  1365  062264                      $RETURN NOERROR
        062264  000241                                                  CLC
        062266  000207                                                  RTS PC
  1366                              .DSABL  LSB
```

```
1369 062270                            MAST06: SUBTST  <<MULTIPORT ASYCHRONOUS ADDRESS UNIQUENESS TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MULTIPORT ASYCHRONOUS ADDRESS UNIQUENESS TEST
                                       ;*****************************************************************************
1370
1371 062270  012737  177772  002676          .ENABL  LSB
1372 062276  013777  002676  120464          MOV     #-6,@DISPLAY
1373 062304                                  MOV     @DISPLAY,@DISPLAY
                                             FOR BANK := #1 TO #167
     062304  012737  000001  002106                                                  MOV #1,BANK
     062312                                                                  B142:::::::
1374 062312  013737  002510  002114            MOV   ALLCPUS,CPUBIT
1375 062320  004737  042422                    CALL  EXBANK
1376 062324  012737  000020  002114            MOV   #MASTER,CPUBIT
1377 062332                                    IF PFLAG IS FALSE AND ACFLAG IS TRUE
     062332  005737  002130                                                        TST PFLAG
     062336  001074                                                              BNE L674
     062340  005737  002124                                                      TST ACFLAG
     062344  001471                                                              BEQ L674
1378 062346                                      FOR R0 := #0 TO #3                ;R0 := STARTING ADDRESS INDEX
     062346  005000                                                              CLR R0
     062350                                                                  B143:::::::
1379 062350  010003                              MOV       R0,R3
1380 062352  072327  000015                      ASH       #13.,R3
1381 062356  062703  060000                      ADD       #FIRST,R3
1382 062362                                      FOR R2 :- #0 TO SLAVES
     062362  005002                                                              CLR R2
     062364                                                                  B144:::::::
1383 062364  062703  020000                        ADD     #SIZE/2,R3
1384 062370                                        IF R3 EQ #LAST+2 THEN LET R3 :  #FIRST
     062370  020327  160000                                                      CMP R3,#LAST+2
     062374  001002                                                              BNE L675
     062376  012703  060000                                                      MOV #FIRST,R3
     062402                                                                  L675:::::::
1385 062402                                        PUSH    R3                        MOV R3,-(SP)
     062402  010346
1386 062404  000241                                CLC
1387 062406  006003                                ROR     R3
1388 062410  010201                                MOV     R2,R1
1389 062412  006301                                ASL     R1                ;R1 := SLAVE #
1390 062414  062703  000011                        ADD     #11,R3
1391 062420  010361  002616                        MOV     R3,TASK(R1)       ;ORDER FOR ASYCHRONOUS ADD UNIQUE TEST
1392 062424                                        POP     R3
     062424  012603                                                                  MOV (SP)+,R3
1393 062426                                      END ;OF FOR R2
     062426  005202                                                                  INC R2
     062430  020237  002730                                                        CMP R2,SLAVES
     062434  003753                                                                BLE B144
     062436                                                                  E144:::::::
1394 062436                                      PUSH      R0
     062436  010046                                                                MOV R0,-(SP)
1395 062440  004737  050726                      CALL      TASKDO            ;MASTER ASSUMES THE SLAVES ROLE
1396 062444                                      POP       R0
     062444  012600                                                                MOV (SP)+,R0
1397 062446                                      FOR R2 :  #0 TO SLAVES
     062446  005002                                                              CLR R2
     062450                                                                  B145:::::::
1398 062450  010201                              MOV     R2,R1
```

```
1399 062452  006301                          ASL     R1
1400 062454  012737  061165  002574          MOV     #5*SECONDS,HUNGTIME
1401 062462  004737  072154          1$:     CALL    QUE
1402 062466                                  ON.ERROR
     062466  103005                                                      BLC L676
1403 062470  010237  002056                    MOV   R2,BAD
1404 062474  104060                          ERROR +60                ;SLAVE HUNG SYSTEM!
1405 062476                                  $RETURN ERROR
     062476  000261                                                    SEC
     062500  000207                                                    RTS PC
1406 062502                                  END ;OF ON.ERROR
     062502                                                       L676:;;;;;;
1407 062502  005761  002616                  TST     TASK(R1)
1408 062506  100365                          BPL     1$
1409 062510                                END ;OF FOR R2
     062510  005202                                                    INC R2
     062512  020237  002730                                          CMP R2,SLAVES
     062516  003754                                                  BLE B145
     062520                                                       E145:;;;;;;;
1410 062520                                  END ;OF FOR R0
     062520  005200                                                    INC R0
     062522  020027  000003                                          CMP R0,#3
     062526  003710                                                  BLE B143
     062530                                                       E143:;;;;;;;
1411 062530                                END ;OF IF PFLAG
     062530                                                       L674:;;;;;;
1412 062530                                END ;OF FOR BANK
     062530  005237  002106                                          INC BANK
     062534  023727  002106  000167                                  CMP BANK,#167
     062542  003663                                                  BLE B142
     062544                                                       E142:;;;;;;;
1413 062544                                $RETURN NOERROR
     062544  000241                                                    CLC
     062546  000207                                                    RTS PC
1414                                         .DSABL  LSB
```

```
1417 062550                                MAST07: SUBTST  <<MULTIPORT SKEWED UP ADDRESS TEST>>
                                           ;*****************************************************************
                                           ;*SUBTEST       MULTIPORT SKEWED UP ADDRESS TEST
                                           ;*****************************************************************
1418
1419 062550  012737  177771  002676                .ENABL  LSB
1420 062556  013777  002676  120204                MOV     #-7,MDISPLAY
1421 062564                                        MOV     MDISPLAY,@DISPLAY
                                                   FOR BANK :- #1 TO #167
     062564  012737  000001  002106                                                    MOV #1,BANK
     062572                                                                        B146:::::::
1422 062572  013737  002510  002114                  MOV   ALLCPUS,CPUBIT
1423 062600  004737  042422                         CALL  EXBANK
1424 062604  012737  000020  002114                  MOV   #MASTER,CPUBIT
1425 062612                                         IF PFLAG IS FALSE AND ACFLAG IS TRUE
     062612  005737  002130                                                          TST PFLAG
     062616  001057                                                                BNE L677
     062620  005737  002124                                                        TST ACFLAG
     062624  001454                                                                BEQ L677
1426 062626                                           FOR R2 :  #0 TO #6 BY #2
     062626  005002                                                                CLR R2
     062630                                                                    B147:::::::
1427 062630                                             FOR RC := #0 TO SLAVES
     062630  005000                                                                CLR R0
     062632                                                                    B150:::::::
1428 062632  010001                                       MOV     R0,R1
1429 062634  006301                                       ASL     R1
1430 062636  010203                                       MOV     R2,R3          ;ADDRESS OFFSET (0,2,4,6)
1431 062640  000303                                       SWAB    R3
1432 062642  062703  000012                               ADD     #12,R3
1433 062646  010361  002616                               MOV     R3,TASK(R1)    ;ORDER SKEWED UP ADDRESS TEST
1434 062652                                             END ;OF FOR R0
     062652  005200                                                                INC R0
     062654  020037  002730                                                        CMP R0,SLAVES
     062660  003764                                                                BLE B150
     062662                                                                    E150:::::::
1435 062662                                             PUSH    R2                     MOV R2,-(SP)
     062662  010246
1436 062664  004737  050726                           CALL    TASKDO
1437 062670                                           POP     R2
     062670  012602                                                                MOV (SP)+,R2
1438 062672                                           FOR R0 :  #0 TO SLAVES
     062672  005000                                                                CLR R0
     062674                                                                    B151:::::::
1439 062674  010001                                       MOV     RC,R1
1440 062676  006301                                       ASL     R1
1441 062700  012737  061165  002574                      MOV     #5*SECONDS,HUNGTIME
1442 062706  004737  072154          1$:                  CALL    QUE
1443 062712                                               ON.ERROR
     062712  103005                                                                BCC L700
1444 062714  010037  002056                                 MOV   R0,BAD
1445 062720  104060                                       ERROR +60              ;SLAVE HUNG SYSTEM.
1446 062722                                               $RETURN ERROR
     062722  000261                                                                SEC
     062724  000207                                                                RTS PC
1447 062726                                             END ;OF ON.ERROR
     062726                                                                    L700:::::::
1448 062726  005761  002616                           TST     TASK(R1)
```

```
1449 062732  100365                                    BPL     1$
1450 062734                                          END ;OF FOR R0
     062734  005200                                                    INC R0
     062736  020037  00273C                                          CMP R0,SLAVES
     062742  003754                                                  BLE B151
     062744                                                       E151:::::::
1451 062744                                          END ;OF FOR R2
     062744  062702  000002                                        ADD #2,R2
     062750  020227  000006                                        CMP R2,#6
     062754  003725                                                BLE B147
     062756                                                       E147:::::::
1452 062756                                        END ;OF IF PFLAG
     062756                                                       L677:::::::
1453 062756                                      END ;OF FOR BANK
     062756  005237  002106                                      INC BANK
     062762  023727  002106  000167                              CMP BANK,#167
     062770  003700                                              BLE B146
     062772                                                       E146:::::::
1454 062772                                      $RETURN NOERROR
     062772  000241                                              CLC
     062774  000207                                              RTS PC
1455                                             .DSABL  LSB
```

```
 1458 062776                    MAST10: SUBTST <<MULTIPORT PORT ARBITRATION SYMMETRY TEST>>
                                ;*****************************************************************
                                ;*SUBTEST       MULTIPORT PORT ARBITRATION SYMMETRY TEST
                                ;*****************************************************************
 1459                                   .ENABL  LSB
 1460 062776                            IF NOCLOCK IS TRUE THEN $RETURN NOERROR
      062776  005737  002104                                                    TST NOCLOCK
      063002  001402                                                           BEQ L701
      063004  000241                                                           CLC
      063006  000207                                                           RTS PC
      063010                                                            L701:::::::
 1461 063010  012737  177770  002676        MOV     #-10,MDISPLAY
 1462 063016  013777  002676  117744        MOV     MDISPLAY,@DISPLAY
 1463 063024                                FOR BANK := #1 TO #167
      063024  012737  000001  002106                                            MOV #1,BANK
      063032                                                            B152:::::::
 1464 063032  013737  002510  002114         MOV   ALLCPUS,CPUBIT
 1465 063040  004737  042422                 CALL  EXBANK
 1466 063044  012737  000020  002114         MOV   #MASTER,CPUBIT
 1467 063052                                IF PFLAG IS FALSE AND ACFLAG IS TRUE
      063052  005737  002130                                                    TST PFLAG
      063056  001070                                                           BNE L702
      063060  005737  002124                                                    TST ACFLAG
      063064  001465                                                           BEQ L702
 1468 063066                                 FOR R0 := #0 TO SLAVES
      063066  005000                                                           CLR R0
      063070                                                            B153:::::::
 1469 063070  010001                           MOV     R0,R1
 1470 063072  006301                           ASL     R1
 1471 063074  012761  000405  002616          MOV     #405,TASK(R1)    ;ORDERS FOR PORT ARBITRATION SYMMETRY TEST
 1472 063102                                 END ;OF FOR R0
      063102  005200                                                           INC R0
      063104  020037  002730                                                    CMP R0,SLAVES
      063110  003767                                                           BLE B153
      063112                                                            E153:::::::
 1473 063112  004737  050726                 CALL    TASKDO
 1474 063116                                 FOR R0 := #0 TO SLAVES
      063116  005000                                                           CLR R0
      063120                                                            B154:::::::
 1475 063120  010001                           MOV     R0,R1
 1476 063122  006301                           ASL     R1
 1477 063124  012737  061165  002574          MOV     #5*SECONDS,HUNGTIME
 1478 063132  004737  072154  1$:             CALL    QUE
 1479 063136                                  ON.ERROR
      063136  103005                                                           BCC L703
 1480 063140  010037  002056                   MOV     R0,BAD
 1481 063144  104060                           ERROR   +60                ;SLAVE HUNG SYSTEM!
 1482 063146                                   $RETURN ERROR
      063146  000261                                                           SEC
      063150  000207                                                           RTS PC
 1483 063152                                  END ;OF ON.ERROR
      063152                                                            L703:::::::
 1484 063152  005761  002616                  TST     TASK(R1)
 1485 063156  100365                          BPL     1$
 1486 063160                                 END ;OF FOR R0
      063160  005200                                                           INC R0
      063162  020037  002730                                                    CMP R0,SLAVES
```

```
      063166  003754                                                                    BLE B154
      063170                                                                          E154:::::::
 1487 063170                          BEGIN BALANCE
      063170                                                                          B155:::::::
 1488 063170                          FOR R0 :  #0 TO SLAVES
      063170  005000                                                                    CLR R0
      063172                                                                          B156:::::::
 1489 063172  010001                    MOV       R0,R1
 1490 063174  006301                    ASL       R1
 1491 063176  013702  002646            MOV       PORTCOUNT,R2
 1492 063202  166102  002646            SUB       PORTCOUNT(R1),R2
 1493 063206  062702  000006            ADD       #6,R2          ;SPECKED FOR + OR - 6 = 5%
 1494 063212                            IF R2 LT #0 OR R2 GT #12.
      063212  005702                                                                    TST R2
      063214  002403                                                                    BLT L704
      063216  020227  000014                                                           CMP R2,#12.
      063222  003402                                                                    BLE L705
      063224                                                                          L704:::::::
 1495 063224  104036                      ERROR   +36
 1496 063226                              LEAVE BALANCE
      063226  000404                                                                    BR E155
 1497 063230                            END ;OF IF R2
      063230                                                                          L705:::::::
 1498 063230                          END ;OF FOR R0
      063230  005200                                                                    INC R0
      063232  020037  002730                                                           CMP R0,SLAVES
      063236  003755                                                                    BLE B156
      063240                                                                          E156:::::::
 1499 063240                            END BALANCE
      063240                                                                          E155:::::::
 1500 063240                        END ;OF IF PFLAG
      063240                                                                          L702:::::::
 1501 063240                      END ;OF FOR BANK
      063240  005237  002106                                                           INC BANK
      063244  023727  002106  000167                                                 CMP BANK,#167
      063252  003667                                                                    BLE B152
      063254                                                                          E152:::::::
 1502 063254                      $RETURN NOERROR
      063254  000241                                                                    CLC
      063256  000207                                                                    RTS PC
 1503                             .DSABL  LSB
```

```
1506 063260                            MAST11: SUBTST  <<MULTIPORT PORT I/O PRIORITY TEST>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       MULTIPORT PORT I/O PRIORITY TEST
                                       ;*****************************************************************************
                                       ;
1507                                           ;THIS TESTS THE ABILITY OF THE MEMORY PORT TO GIVE I/O HIGHER
1508                                           ;PRIORITY THEN CPU ACCESSES
1509                                           ;
1510                                           ;IT DOES THIS BY USING MARGIN #6 IN THE CPU'S MAINT REGISTER
1511                                           ;TO RAISE THE CPU PRIORITY TO THAT OF I/O.
1512                                           ;
1513                                           ;EACH CPU (EXCEPT ONE) HAS HIS PRIORITY RAISED AND
1514                                           ;A TEST IS PERFORMED TO INSURE THAT THESE CPUS ARE GRANTED MORE
1515                                           ;CYCLES THEN THE OTHER CPU.
1516
1517                                           ;NEED LINE CLOCK
1518 063260                                    IF NOCLOCK IS TRUE THEN $RETURN NOERROR
     063260  005737  002104                                                    TST NOCLOCK
     063264  001402                                                            BEQ L706
     063266  000241                                                            CLC
     063270  000207                                                            RTS PC
     063272                                                           L706:::::::
1519
1520                                           ;CAN'T DO UNLESS 4 CPU'S
1521 063272                                    IF SLAVES LT #3 THEN $RETURN NOERROR
     063272  023727  002730  000003                                            CMP SLAVES,#3
     063300  002002                                                            BGE L707
     063302  000241                                                            CLC
     063304  000207                                                            RTS PC
     063306                                                           L707:::::::
1522
1523 063306  012737  177767  002676           MOV     #-11,MDISPLAY
1524 063314  013777  002676  117446           MOV     MDISPLAY,@DISPLAY
```

```
1527                                        ;FOR EACH BANK THAT IS ACCESSABLE BY ALL CPU'S
1528 063322                                 FOR BANK :- #1 TO #167
     063322  012737  000001  002106                                                  MOV #1,BANK
     063330                                                                  B157:::::::
1529 063330  013737  002510  002114          MOV   ALLCPUS,CPUBIT
1530 063336  004737  042422                 CALL  EXBANK
1531 063342  012737  000020  002114          MOV   #MASTER,CPUBIT
1532 063350  013701  002110                 MOV BANKINDEX,R1
1533 063354                                 IF #BIT3 OFF.IN CONFIG(R1) ;IF NO EXTERNAL INTERLEAVE
     063354  032761  000010  003016                                                  BIT #BIT3,CONFIG(R1)
     063362  001077                                                                  BNE L710
1534 063364                                   IF PFLAG IS FALSE AND ACFLAG IS TRUE
     063364  005737  002130                                                          TST PFLAG
     063370  001074                                                                  BNE L711
     063372  005737  002124                                                          TST ACFLAG
     063376  001471                                                                  BEQ L711
1535
1536                                          ;EACH CPU HAS LOW PRIORITY ONCE
1537 063400                                   FOR I :- #0 TO SLAVES
     063400  005037  002602                                                          CLR I
     063404                                                                  B160:::::::
1538 063404                                     FOR J := #0 TO SLAVES
     063404  005037  002604                                                          CLR J
     063410                                                                  B161:::::::
1539 063410                                       IF I NE J ;IF NOT THE LOW PRIORITY CPU
     063410  023737  002602  002604                                                  CMP I,J
     063416  001416                                                                  BEQ L712
1540 063420  013701  002604                         MOV J,R1
1541 063424  006301                                 ASL R1
1542 063426  012761  000016  002616                 MOV #16,TASK(R1)            ;ORDER MARGIN #6
1543 063434                                         IF J EQ #0
     063434  005737  002604                                                          TST J
     063440  001003                                                                  BNE L713
1544 063442  004737  050726                           CALL TASKDO
1545 063446                                         ELSE
     063446  000402                                                                  BR L714
     063450                                                                  L713:::::::
1546 063450  004737  063674                           CALL WAIT5
1547 063454                                         END ;OF IF J EQ #0
     063454                                                                  L714:::::::
1548 063454                                       END ;OF IF I NE J
     063454                                                                  L712:::::::
1549 063454                                     END ;OF FOR J :  #0 TO SLAVES
     063454  005237  002604                                                          INC J
     063460  023737  002604  002730                                                  CMP J,SLAVES
     063466  003750                                                                  BLE B161
     063470                                                                  E161:::::::::
1550
1551                                          ;EVERY CPU WILL DO PORT ARBITRATION TEST
1552 063470                                   FOR R0 :- #0 TO SLAVES
     063470  005000                                                          CLR R0
     063472                                                                  B162:::::::
1553 063472  010001                             MOV   R0,R1
1554 063474  006301                             ASL   R1
1555 063476  012761  000005  002616             MOV #5,TASK(R1)        ;ORDER PORT ARBITRATION TEST
1556 063504                                   END ;OF FOR R0
     063504  005200                                                          INC R0
```

```
        063506  020037  002730                                                          CMP R0,SLAVES
        063512  003767                                                                  BLE B162
        063514                                                                  E162:;;;;;;;
  1557  063514  004737  050726                  CALL     TASKDO
  1558
  1559                                          ;WAIT FOR DONE
  1560  063520                                  FOR R0 := #0 TO SLAVES
        063520  005000                                                                  CLR R0
        063522                                                                  B163:;;;;;;
  1561  063522  010001                            MOV   R0,R1
  1562  063524  006301                            ASL   R1
  1563  063526  004737  063674                    CALL WAIT5
  1564  063532                                  END ;OF FOR R0
        063532  005200                                                                  INC R0
        063534  020037  002730                                                          CMP R0,SLAVES
        063540  003770                                                                  BLE B163
        063542                                                                  E163:;;;;;;;
  1565
  1566                                          ;CHECK RESULTS FOR PROPER SKEWING
  1567  063542  004737  063602                  CALL MST11A
  1568  063546                                 END ;OF FOR I :  #0 TO SLAVES
        063546  005237  002602                                                          INC I
        063552  023737  002602  002730                                                 CMP I,SLAVES
        063560  003711                                                                  BLE B160
        063562                                                                  E160:;;;;;;;
  1569  063562                                    END ;OF IF PFLAG
        063562                                                                  L711:;;;;;;
  1570  063562                                  END ;OF IF #BIT3 OFF.IN CONFIG(R1)
        063562                                                                  L710:;;;;;;
  1571  063562                                END ;OF FOR BANK
        063562  005237  002106                                                          INC BANK
        063566  023727  002106  000167                                                 CMP BANK,#167
        063574  003655                                                                  BLE B157
        063576                                                                  E157:;;;;;;;
  1572  063576                                $RETURN NOERROR
        063576  000241                                                                  CLC
        063600  000207                                                                  RTS PC
```

```
1575 063602                          MST11A: SUBTST  <<CHECK FOR PROPER SKEWING OF ACCESSES>>
                                     ;*********************************************************************
                                     ;*SUBTEST       CHECK FOR PROPER SKEWING OF ACCESSES
                                     ;*********************************************************************
1576 063602                                  BEGIN NOBALANCE
     063602                                                                          B164:;;;;;;
1577
1578 063602                                    ;FOR EACH CPU
                                               FOR R0 :- #0 TO SLAVES
     063602  005000                                                                       CLR R0
     063604                                                                          B165:;;;;;;
1579 063604  010001                              MOV R0,R1
1580 063606  006301                              ASL R1
1581 063610  013703  002602                      MOV I,R3
1582 063614  006303                              ASL R3
1583 063616  016302  002646                      MOV PORTCOUNT(R3),R2        ;LOW PRIORITY PORT
1584 063622  016104  002646                      MOV PORTCOUNT(R1),R4
1585 063626  160402                              SUB R4,R2                   ;HIGH PRIORITY PORT
1586 063630  006204                              ASR R4
1587 063632  006204                              ASR R4
1588 063634  006204                              ASR R4                      ;R4 = 12.5% OF HIGH PRIORITY PORT
1589 063636                                      IF R0 NE I                  ;IF THE CPU SELECTED IS NOT THE LOW PRIORITY ONE
     063636  020037  002602                                                          CMP R0,I
     063642  001407                                                                  BEQ L715
1590 063644                                        IF R2 LT R4
     063644  020204                                                                  CMP R2,R4
     063646  002005                                                                  BGE L716
1591 063650  013737  002602  002056                  MOV I,BAD
1592 063656  104066                                  ERROR +66
1593 063660                                           LEAVE NOBALANCE
     063660  000404                                                                  BR E164
1594 063662                                        END ;OF IF R2
     063662                                                                     L716:;;;;;;
1595 063662                                      END ;OF IF R0 NE I
     063662                                                                     L715:;;;;;;
1596 063662                                    END ;OF FOR R0
     063662  005200                                                                   INC R0
     063664  020037  002730                                                          CMP R0,SLAVES
     063670  003745                                                                  BLE B165
     063672                                                                     E165:;;;;;;;
1597 063672                                  END NOBALANCE
     063672                                                                     E164:;;;;;.
1598 063672  000207                          RETURN
1599
1600 063674                          WAIT5:  SUBTST  <<WAIT FOR 5 SECONDS FOR A SLAVE>>
                                     ;*********************************************************************
                                     ;*SUBTEST       WAIT FOR 5 SECONDS FOR A SLAVE
                                     ;*********************************************************************
1601                                         .ENABL LSB
1602 063674  012737  061165  002574         MOV     #5*SECONDS,HUNGTIME
1603 063702  004737  072154          1$.    CALL    QUE
1604 063706                                  ON.ERROR
     063706  103005                                                                  BCC L717
1605 063710  010037  002056                    MOV   R0,BAD
1606 063714  104060                            ERROR +60                   ;SLAVE HUNG SYSTEM.
1607 063716                                    $RETURN ERROR
     063716  000261                                                                  SEC
     063720  000207                                                                  RTS PC
```

```
 1608 063722                            END ;OF ON.ERROR
      063722
 1609 063722  005761  002616            TST     TASK(R1)
 1610 063726  100365                    BPL     1$
 1611 063730  000207                    RETURN
 1612                                   .DSABL LSB
```

```
 1615 063732                            MAST12: SUBTST  <<MULTIPORT EXECUTION CONTENTION TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MULTIPORT EXECUTION CONTENTION TEST
                                        ;*****************************************************************************
 1616
 1617 063732  012737  177766  002676           .ENABL  LSB
 1618 063740  013777  002676  117022           MOV     #-12,MDISPLAY
 1619 063746                                   MOV     MDISPLAY,@DISPLAY
       063746  012737  000001  002106          FOR BANK := #1 TO #167                                  MOV #1,BANK
       063754                                                                                  B166:::::::
 1620 063754  013737  002510  002114             MOV   ALLCPUS,CPUBIT
 1621 063762  004737  042422                     CALL  EXBANK
 1622 063766  012737  000020  002114             MOV   #MASTER,CPUBIT
 1623 063774                                     IF PFLAG IS FALSE AND ACFLAG IS TRUE
       063774  005737  002130                                                                        TST PFLAG
       064000  001067                                                                               BNE L720
       064002  005737  002124                                                                        TST ACFLAG
       064006  001464                                                                               BEQ L720
 1624 064010  004737  053640                       CALL        MRUNSETUP
 1625 064014                                       FOR R0 := #0 TO SLAVES
       064014  005000                                                                               CLR R0
       064016                                                                                  B167:::::::
 1626 064016  010001                                 MOV        R0,R1
 1627 064020  006301                                 ASL        R1
 1628 064022  005061  002636                         CLR        PTYBUF(R1)          ;CLEAR INC COUNTER
 1629 064026  012761  000004  002616                 MOV        #4,TASK(R1)         ;ORDER FOR EXECUTION CONTENTION TEST
 1630 064034                                       END ;OF FOR R0
       064034  005200                                                                               INC R0
       064036  020037  002730                                                                       CMP R0,SLAVES
       064042  003765                                                                               BLE B167
       064044                                                                                  E167:::::::
 1631 064044  004737  050726                       CALL        TASKDO
 1632 064050                                       FOR R0 :  #0 TO SLAVES
       064050  005000                                                                               CLR R0
       064052                                                                                  B170:::::::
 1633 064052  010001                                 MOV        R0,R1
 1634 064054  006301                                 ASL        R1
 1635 064056  012737  061165  002574                 MOV        #5*SECONDS,HUNGTIME
 1636 064064  004737  072154           1$:         CALL        QUE
 1637 064070                                       ON.ERROR
       064070  103005                                                                               BCC L721
 1638 064072  010037  002056                         MOV     R0,BAD
 1639 064076  104060                                 ERROR   +60                 ;SLAVE HUNG SYSTEM!
 1640 064100                                       $RETURN ERROR
       064100  000261                                                                               SEC
       064102  000207                                                                               RTS PC
 1641 064104                                       END ;OF ON.ERROR
       064104                                                                                  L721:::::::
 1642 064104  005761  002616                       TST         TASK(R1)
 1643 064110  100365                               BPL         1$
 1644 064112                                     END ;OF FOR R0
       064112  005200                                                                               INC R0
       064114  020037  002730                                                                       CMP R0,SLAVES
       064120  003754                                                                               BLE B170
       064122                                                                                  E170:::::::
 1645 064122                                     BEGIN RUNCOUNT
       064122                                                                                  B171:::::::
```

```
1646 064122                                    FOR R0 := #0 TO SLAVES
     064122  005000                                                          CLR R0
     064124                                                                B172::::::
1647 064124  010001                              MOV     R0,R1
1648 064126  006301                              ASL     R1
1649 064130  013702  002636                      MOV     PTYBUF,R2
1650 064134  166102  002636                      SUB     PTYBUF(R1),R2
1651 064140                                      IF R2 NE #0
     064140  005702                                                          TST R2
     064142  001402                                                          BEQ L722
1652 064144  104052                                ERROR +52
1653 064146                                        LEAVE RUNCOUNT
     064146  000404                                                          BR E171
1654 064150                                      END ;OF IF R2
     064150                                                                L722::::::
1655 064150                                    END ;OF FOR R0
     064150  005200                                                          INC R0
     064152  020037  002730                                                  CMP R0,SLAVES
     064156  003762                                                          BLE B172
     064160                                                                E172:::::::
1656 064160                                  END RUNCOUNT
     064160                                                                E171::::::
1657 064160                                END ;OF IF PFLAG
     064160                                                                L720::::::
1658 064160                              END ;OF FOR BANK
     064160  005237  002106                                                  INC BANK
     064164  023727  002106  000167                                          CMP BANK,#167
     064172  003670                                                          BLE B166
     064174                                                                E166:::::::
1659 064174                              $RETURN NOERROR
     064174  000241                                                          CLC
     064176  000207                                                          RTS PC
1660                                     .DSABL  LSB
1661
1662 064200                         MAST13: SUBTST  <<MULTIPORT ASRB TEST>>
                                    ;*****************************************************************************
                                    ;*SUBTEST       MULTIPORT ASRB TEST
                                    ;*****************************************************************************
1663 064200  000137  053752                JMP     SUPM13          ;ACTUAL ROUTINE MUST BE IN SUPERVISOR SPACE
```

```
 1666 064204                            MAST14: SUBTST  <<MULTIPORT CACHE FLUSH TEST>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       MULTIPORT CACHE FLUSH TEST
                                        ;*****************************************************************************
 1667                                           ;WARNING FAILURES HERE ARE USUALLY DUE TO A CACHE PROBLEM
 1668                                           ;NOT A MAIN MEMORY PROBLEM!!!!!!!. !!!!!!!. !!!!!!!!!!!
 1669                                           .ENABL  LSB
 1670 064204                                    IF #BIT3 SET.IN CACHK OR #BIT2 SET.IN CACHK
      064204  032737  000010  002700                                                        BIT #BIT3,CACHK
      064212  001004                                                                       BNE L723
      064214  032737  000004  002700                                                        BIT #BIT2,CACHK
      064222  001402                                                                       BEQ L724
      064224                                                                        L723:;;;;;;
 1671 064224                                      $RETURN NOERROR       ;OPERATOR HAS DISABLED PART OF CACHE
      064224  000241                                                                       CLC
      064226  000207                                                                       RTS PC
 1672 064230                                    END ,OF IF #BIT3
      064230                                                                        L724:;;;;;;
 1673
 1674 064230  012737  177764  002676            MOV     #-14,MDISPLAY
 1675 064236  013777  002676  116524            MOV     MDISPLAY,@DISPLAY
 1676
 1677 064244                                    FOR R0 :  #0 TO SLAVES
      064244  005000                                                                       CLR R0
      064246                                                                        B173:;;;;;;
 1678 064246  010001                              MOV   R0,R1
 1679 064250  006301                              ASL   R1
 1680 064252                                      FOR BANK := #1 TO #167
      064252  012737  000001  002106                                                        MOV #1,BANK
      064260                                                                        B174:;;;;;;
 1681 064260  013737  002510  002114                MOV ALLCPUS,CPUBIT
 1682 064266  004737  042422                      CALL        EXBANK
 1683 064272  012737  000020  002114              MOV #MASTER,CPUBIT
 1684 064300                                      IF PFLAG IS FALSE AND ACFLAG IS TRUE
      064300  005737  002130                                                        TST PFLAG
      064304  001056                                                                BNE L725
      064306  005737  002124                                                        TST ACFLAG
      064312  001453                                                                BEQ L725
 1685 064314                                        FOR R3 :  #0 TO SLAVES
      064314  005003                                                                CLR R3
      064316                                                                B175:;;;;;;
 1686 064316  010304                                MOV     R3,R4
 1687 064320  006304                                ASL     R4
 1688 064322                                        IF R4 EQ R1
      064322  020401                                                                CMP R4,R1
      064324  001004                                                                BNE L726
 1689 064326  012764  000020  002616                  MOV   #20,TASK(R4)    ;CACHE FLUSH TEST COMMAND
 1690 064334                                        ELSE
      064334  000403                                                                BR L727
      064336                                                                L726:;;;;;;
 1691 064336  012764  000017  002616                  MOV   #17,TASK(R4)    ;CREATE STALE DATA COMMAND
 1692 064344                                        END ;OF IF R4
      064344                                                                L727:;;;;;;
 1693 064344                                      END ;OF FOR R3
      064344  005203                                                                INC R3
      064346  020337  002730                                                        CMP R3,SLAVES
      064352  003761                                                                BLE B175
```

```
        064354
1694    064354                                  PUSH    R0,R1
        064354  010046
        064356  010146
1695    064360  004737  050726                  CALL    TASKDO
1696    064364                                  POP     R1,R0
        064364  012601
        064366  012600
1697    064370                                  FOR R3 := #0 TO SLAVES
        064370  005003
        064372
1698    064372  010304                            MOV     R3,R4
1699    064374  006304                            ASL     R4
1700    064376  012737  061165  002574            MOV     #5*SECONDS,HUNGTIME
1701    064404  004737  072154          2$:       CALL    QUE
1702    064410                                    ON.ERROR
        064410  103005
1703    064412  010337  002056                      MOV   R3,BAD
1704    064416  104060                              ERROR +60                ;SLAVE HUNG SYSTEM!
1705    064420                                      $RETURN ERROR
        064420  000261
        064422  000207
1706    064424                                    END ;OF ON.ERROR
        064424
1707    064424  005764  002616                    TST     TASK(R4)
1708    064430  100365                            BPL     2$
1709    064432                                  END ;OF FOR R3
        064432  005203
        064434  020337  002730
        064440  003754
        064442
1710    064442                                END ;OF IF PFLAG
        064442
1711    064442                              END ;OF FOR BANK
        064442  005237  002106
        064446  023727  002106  000167
        064454  003701
        064456
1712    064456                            END ;OF FOR R0
        064456  005200
        064460  020037  002730
        064464  003670
        064466
1713    064466                            $RETURN NOERROR
        064466  000241
        064470  000207
1714                                      .DSABL  LSB

E175:;;;;;;;
                MOV R0,-(SP)
                MOV R1,-(SP)

                MOV (SP)+,R1
                MOV (SP)+,R0

                CLR R3
B176:;;;;;;
                BCC L730

                SEC
                RTS PC
L730:;;;;;;

                INC R3
                CMP R3,SLAVES
                BLE B176
E176:;;;;;;;
L725:;;;;;;
                INC BANK
                CMP BANK,#167
                BLE B174
E174:;;;;;;;
                INC R0
                CMP R0,SLAVES
                BLE B173
E173:;;;;;;;
                CLC
                RTS PC
```

```
1717 064472                            MAST15: SUBTST  <<STOP SLAVES>>
                                       ;*****************************************************************************
                                       ;*SUBTEST       STOP SLAVES
                                       ;*****************************************************************************
1718
1719 064472  012737  177763  002676            .ENABL  LSB
1720 064500  013777  002676  116262            MOV     #-15,@DISPLAY
1721 064506                                    MOV     @DISPLAY,@DISPLAY
                                               FOR R0 := #1 TO SLAVES
     064506  012700  000001                                                    MOV #1,R0
     064512                                                                B177:::::::
1722 064512  010001                              MOV   R0,R1
1723 064514  006301                              ASL   R1
1724 064516  012761  000006  002616              MOV   #6,TASK(R1)          ;ORDER STOP TASK
1725 064524  012737  023542  002574              MOV   #2*SECONDS,HUNGTIME
1726 064532  004737  072154          1$:         CALL  QUE
1727 064536                                      ON.ERROR
     064536  103005                                                          BCC L731
1728 064540  010037  002056                        MOV R0,BAD
1729 064544  104060                              ERROR       +60                ;SLAVE HUNG SYSTEM!
1730 064546                                      $RETURN ERROR
     064546  000261                                                          SEC
     064550  000207                                                          RTS PC
1731 064552                                      END ;OF ON.ERROR
     064552                                                                L731::::::
1732 064552  005761  002616                      TST   TASK(R1)
1733 064556  100365                            BPL   1$
1734 064560                                    END ;OF FOR R0
     064560  005200                                                          INC R0
     064562  020037  002730                                                  CMP R0,SLAVES
     064566  003751                                                          BLE B177
     064570                                                                E177:::::::
1735 064570                                    $RETURN NOERROR
     064570  000241                                                          CLC
     064572  000207                                                          RTS PC
1736                                           .DSABL  LSB
```

```
                        .SBTTL  ERROR DATA SETUP

;USE THIS       IF THIS CONDITION DISCRIBES THE ERROR

;PERR01         TRAP
;               BAD DATA IN R0 UNLESS ABORTED
;                       THEN BAD DATA IS POINTED TO BY -(R4)
;               GOOD DATA IN R5

;PERR02         TRAP
;               BAD DATA IN R1 UNLESS ABORTED
;                       THEN BAD DATA IS POINTED TO BY -(R4)
;               GOOD DATA IN R2

;PERR03         TRAP
;               BAD DATA IS POINTED TO BY -(R1)
;               GOOD DATA IN R4

;PERR04         TRAP
;               BAD DATA IN R4 UNLESS ABORTED
;                       HEN BAD DATA IS POINTED TO BY -2(R0)
;               GOOD DATA IN R2

;PERR05         JSR     PC
;               BAD DATA IS POINTED TO BY -(R0)
;               GOOD DATA IN R2
;               RETURN AFTER SETTING UP GOOD,BAD,ADDRESS

;PERR06         JSR     PC
;               BAD DATA IS POINTED TO BY -(R0)
;               GOOD DATA IS ZERO
;               RETURN AFTER SETTING UP GOOD,BAD,ADDRESS

;PERR07         TRAP
;               BAD DATA IN R2 UNLESS ABORTED
;                       THEN BAD DATA IS POINTED TO BY (R1)
;               GOOD DATA IN DATBUF

;PERR10         TRAP
;               BAD DATA IN R2 UNLESS ABORTED
;                       THEN BAD DATA IS POINTED TO BY 2(R1)
;               GOOD DATA IN DATBUF+2

;PERR11         TRAP
;               BYTE TEST
;               BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
;                       THEN BAD DATA IS POINTED TO BY (R1)
;               GOOD DATA IS A ZERO BYTE

;PERR12         TRAP
;               BYTE TEST
;               BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
;                       THEN BAD DATA IS POINTED TO BY (R1)
;               GOOD DATA IS A BYTE OF ONES

;PERR13         TRAP
;               BAD DATA IN R0 UNLESS ABORTED
```

```
1796                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1797                                            ;       GOOD DATA IS ZERO
1798                                            ;
1799                                    PERR14  ;       TRAP
1800                                            ;       BAD DATA IN R0 UNLESS ABORTED
1801                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1802                                            ;       GOOD DATA IS ONES
1803                                            ;
1804                                    PERR15  ;       TRAP
1805                                            ;       BAD DATA IN R0 UNLESS ABORTED
1806                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1807                                            ;       GOOD DATA IN TSTDAT
1808                                            ;
1809                                    PERR16  ;       TRAP
1810                                            ;       BAD DATA IN R0 UNLESS ABORTED
1811                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1812                                            ;       GOOD DATA IN TSTDAT+2
1813                                            ;
1814                                    PERR17  ;       TRAP
1815                                            ;       BAD DATA IN R0 UNLESS ABORTED
1816                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1817                                            ;       GOOD DATA IN R2
1818                                            ;
1819                                    PERR20  ;       TRAP
1820                                            ;       BAD DATA IN R0 UNLESS ABORTED
1821                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1822                                            ;       GOOD DATA IN R3
1823                                            ;
1824                                    PERR21  ;       TRAP
1825                                            ;       7 BIT BYTE TEST
1826                                            ;       BAD DATA IN RIGHT BYTE OF R0 UNLESS ABORTED
1827                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1828                                            ;       GOOD DATA IS A 7 BIT BYTE ON ONES
1829                                            ;
1830                                    PERR22  ;       TRAP
1831                                            ;       BAD DATA IN R2 UNLESS ABORTED
1832                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1833                                            ;       GOOD DATA IN R0
1834                                            ;
1835                                    PERR23  ;       TRAP
1836                                            ;       BAD DATA IN R0 UNLESS ABORTED
1837                                            ;               THEN BAD DATA IS POINTED TO BY (R1)
1838                                            ;       GOOD DATA IN R4
1839                                            ;
1840                                    PERR24  ;       TRAP
1841                                            ;       BAD DATA IN R0 UNLESS ABORTED
1842                                            ;               THEN BAD DATA IS POINTED TO BY (R2)
1843                                            ;       GOOD DATA IN R3
1844                                            ;
1845                                    PERR25  ;       TRAP
1846                                            ;       BAD DATA POINTED TO BY -(R1)
1847                                            ;       GOOD DATA IN R2 UNLESS LOC V177654 IS SET
1848                                            ;               THEN GOOD DATA IS IN R3
1849                                            ;
1850                                    PERR26  ;       TRAP
1851                                            ;       BAD DATA IS DOUBLE WORD POINTED TO BY R1 AND IN LOW 7 BITS OF R0
1852                                            ;       GOOD DATA IS 000000,,100000,,100
```

```
1853
1854                    ;PERR27     TRAP
1855                    ;           BAD DATA IS DOUBLE WORD POINTED TO BY R1 AND IN LOW 7 BITS OF R0
1856                    ;           GOOD DATA IS 000000,,000000,,077
1857                    ;
1858                    ;PERR30     TRAP
1859                    ;           BAD DATA IS POINTED TO BY -16(SP)
1860                    ;           GOOD DATA IS IN R1
1861                    ;
1862                    ;PERR31     TRAP
1863                    ;           SPECIAL ECC FAILURE HANDLER
1864                    ;
1865                    ;PERR32     TRAP
1866                    ;           SPECIAL ECC FAILURE HANDLER
1867                    ;
1868                    ;PERR33     TRAP
1869                    ;           SPECIAL ECC FAILURE HANDLER
1870                    ;
1871                    ;PERR34     TRAP
1872                    ;           SPECIAL ECC FAILURE HANDLER
1873                    ;
1874                    ;PERR35     TRAP
1875                    ;           SPECIAL BRANCH GOBBLE FAILURE HANDLER
1876                    ;
1877                    ;       CALLING SEQUENCE FOR TRAP TYPES
1878                    ;       BEQ     2$              ;NO - ERROR,BRANCH FOR CARD
1879                    ;       PERRXX                  ;TRAP TO ERROR ROUTINE
1880                    ;2$:    NEXT    INSTRUCTION     ;CONTINUE TESTING
```

ERROR DATA SETUP

```
1883 064574  010437  002040          $PER01: MOV     R4,ADDRESS
1884 064600  162737  000002  002040          SUB     #2,ADDRESS
1885 064606  010037  002056                  MOV     R0,BAD
1886 064612  010537  002050                  MOV     R5,GOOD
1887 064616  000137  065330                  JMP PERRAW
1888
1889 064622  010437  002040          $PER02: MOV     R4,ADDRESS
1890 064626  162737  000002  002040          SUB     #2,ADDRESS
1891 064634  010137  002056                  MOV     R1,BAD
1892 064640  010237  002050                  MOV     R2,GOOD
1893 064644  000137  065330                  JMP PERRAW
1894
1895 064650  010137  002040          $PER03: MOV     R1,ADDRESS
1896 064654  162737  000002  002040          SUB     #2,ADDRESS
1897 064662  010437  002050                  MOV     R4,GOOD
1898 064666  016137  177776  002056          MOV     -2(R1),BAD
1899 064674  000137  065330                  JMP PERRAW
1900
1901 064700  010037  002040          $PER04: MOV     R0,ADDRESS
1902 064704  162737  000002  002040          SUB     #2,ADDRESS
1903 064712  010437  002056                  MOV     R4,BAD
1904 064716  010237  002050                  MOV     R2,GOOD
1905 064722  000137  065330                  JMP     PERRAW
1906
1907 064726  010237  002050          PERR05: MOV     R2,GOOD
1908 064732  014037  002056          PERA05: MOV     -(R0),BAD
1909 064736  010037  002040                  MOV     R0,ADDRESS
1910 064742  062700  000002                  ADD     #2,R0           ;RESTORE R0
1911 064746  004737  036770                  CALL    BADSTACK
1912 064752  000207                          RETURN
1913
1914 064754  005037  002050          PERR06: CLR     GOOD
1915 064760  000764                          BR      PERA05
1916
1917 064762  010137  002040          $PER07: MOV     R1,ADDRESS
1918 064766  010237  002056                  MOV     R2,BAD
1919 064772  013737  002340  002050          MOV     DATBUF,GOOD
1920 065000  000137  065330                  JMP     PERRAW
1921
1922 065004                          $PER10: LET ADDRESS := R1 + #2
     065004  010137  002040                                          MOV R1,ADDRESS
     065010  062737  000002  002040                                  ADD #2,ADDRESS
1923 065016                                  LET BAD :  R2
     065016  010237  002056                                          MOV R2,BAD
1924 065022                                  LET GOOD :  DATBUF+2
     065022  013737  002342  002050                                  MOV DATBUF+2,GOOD
1925 065030  000137  065330                  JMP     PERRAW
1926
1927 065034                          $PER11: LET ADDRESS :  R1
     065034  010137  002040                                          MOV R1,ADDRESS
1928 065040                                  LET BAD := R0
     065040  010037  002056                                          MOV R0,BAD
1929 065044                                  LET GOOD :  #0
     065044  005037  002050                                          CLR GOOD
1930 065050  000137  065402                  JMP     PERRAB
1931
1932 065054                          $PER12: LET ADDRESS :  R1
```

ERROR DATA SETUP

SEQ 0941

```
                065054  010137  002040
1933            065060                  ;LET BAD := R0          MOV R1,ADDRESS
                065060  010037  002056
1934            065064                  ;LET GOOD :- #377       MOV R0,BAD
                065064  012737  000377  002050
1935            065072  000137  065402  ;JMP     PERRAB          MOV #377,GOOD
```

```
1938 065076                          $PER13: LET ADDRESS :- R1
     065076  010137  002040                  LET BAD :- R0                  MOV R1,ADDRESS
1939 065102                                   LET GOOD :- #0                 MOV R0,BAD
     065102  010037  002056                   JMP     PERRAW                 CLR GOOD
1940 065106
     065106  005037  002050
1941 065112  000137  065330
1942
1943 065116                          $PER14: LET ADDRESS :- R1
     065116  010137  002040                  LET BAD := R0                  MOV R1,ADDRESS
1944 065122                                   LET GOOD : ONES                MOV R0,BAD
     065122  010037  002056                   JMP     PERRAW                 MOV ONES,GOOD
1945 065126
     065126  013737  002726  002050
1946 065134  000137  065330
1947
1948 065140                          $PER15: LET ADDRESS := R1
     065140  010137  002040                  LET BAD :- R0                  MOV R1,ADDRESS
1949 065144                                   LET GOOD : TSTDAT              MOV R0,BAD
     065144  010037  002056                   JMP     PERRAW                 MOV TSTDAT,GOOD
1950 065150
     065150  013737  002344  002050
1951 065156  000137  065330
1952
1953 065162                          $PER16: LET ADDRESS :- R1
     065162  010137  002040                  LET BAD := R0                  MOV R1,ADDRESS
1954 065166                                   LET GOOD := TSTDAT+2           MOV R0,BAD
     065166  010037  002056                   BR      PERRAW                 MOV TSTDAT+2,GOOD
1955 065172
     065172  013737  002346  002050
1956 065200  000453
1957
1958 065202                          $PER17: LET ADDRESS : R1
     065202  010137  002040                  LET BAD := R0                  MOV R1,ADDRESS
1959 065206                                   LET GOOD := R2                 MOV R0,BAD
     065206  010037  002056                   BR      PERRAW                 MOV R2,GOOD
1960 065212
     065212  010237  002050
1961 065216  000444
1962
1963 065220                          $PER20: LET ADDRESS : R1
     065220  010137  002040                  LET BAD :- R0                  MOV R1,ADDRESS
1964 065224                                   LET GOOD :- R3                 MOV R0,BAD
     065224  010037  002056                   BR      PERRAW                 MOV R3,GOOD
1965 065230
     065230  010337  002050
1966 065234  000435
1967
1968 065236                          $PER21: LET ADDRESS : R1
     065236  010137  002040                  LET BAD :- R0                  MOV R1,ADDRESS
1969 065242                                   LET GOOD :- #177               MOV R0,BAD
     065242  010037  002056                   BR      PERRA7                 MOV #177,GOOD
1970 065246
     065246  012737  000177  002050
1971 065254  000477
1972
1973 065256                          $PER22: LET ADDRESS :- R1
```

```
                065256  010137  002040
1974 065262                             LET BAD :- R2                   MOV R1,ADDRESS
                065262  010237  002056
1975 065266                             LET GOOD :- R0                  MOV R2,BAD
                065266  010037  002050
1976 065272  000416                     BR      PERRAW                  MOV R0,GOOD
1977
1978 065274                     $PER23: LET ADDRESS :  R1
                065274  010137  002040                                  MOV R1,ADDRESS
1979 065300                             LET BAD :- R0
                065300  010037  002056                                  MOV R0,BAD
1980 065304                             LET GOOD :- R4
                065304  010437  002050                                  MOV R4,GOOD
1981 065310  000407                     BR      PERRAW
1982
1983 065312                     $PER24: LET ADDRESS :  R2
                065312  010237  002040                                  MOV R2,ADDRESS
1984 065316                             LET BAD :- R0
                065316  010037  002056                                  MOV R0,BAD
1985 065322                             LET GOOD :  R3
                065322  010337  002050                                  MOV R3,GOOD
1986 065326  000400                     BR      PERRAW
```

```
                        PERRAW: SUBTST  <<DATA WAS A WORD>>
                        ;*************************************************************************
                        ;*SUBTEST       DATA WAS A WORD
                        ;*************************************************************************
1989 065330 004737 065564       CALL    PERBNK
1990 065334                     IF ABORTFLAG IS TRUE THEN $CALL GETDATA
     065334 005737 002142                                               TST ABORTFLAG
     065340 001402                                                      BEQ L732
     065342 004737 055030                                               JSR PC,GETDATA
     065346                                                     L732:;;;;;;
1991 065346                     IF BADPC EQ #0 THEN $CALL BADSTACK
     065346 005737 002026                                               TST BADPC
     065352 001002                                                      BNE L733
     065354 004737 036770                                               JSR PC,BADSTACK
     065360                                                     L733:;;;;;;
1992 065360 004737 065540       CALL    PERXOR
1993 065364                     IF ABORTFLAG IS FALSE
     065364 005737 002142                                               TST ABORTFLAG
     065370 001002                                                      BNE L734
1994 065372 104011                ERROR +11
1995 065374                     ELSE
     065374 000401                                                      BR L735
     065376                                                     L734:;;;;;;
1996 065376 104012                ERROR +12
1997 065400                     END ;OF IF ABORTFLAG
     065400                                                     L735:;;;;;;
1998 065400 000002              RTI
1999
2000 065402                     PERRAB: SUBTST  <<DATA WAS A BYTE>>
                        ;*************************************************************************
                        ;*SUBTEST       DATA WAS A BYTE
                        ;*************************************************************************
2001 065402 004737 065564       CALL    PERBNK
2002 065406                     IF ABORTFLAG IS TRUE THEN $CALL GETDATA
     065406 005737 002142                                               TST ABORTFLAG
     065412 001402                                                      BEQ L736
     065414 004737 055030                                               JSR PC,GETDATA
     065420                                                     L736:;;;;;;
2003 065420                     IF BADPC EQ #0 THEN $CALL BADSTACK
     065420 005737 002026                                               TST BADPC
     065424 001002                                                      BNE L737
     065426 004737 036770                                               JSR PC,BADSTACK
     065432                                                     L737:;;;;;;
2004 065432 004737 065540       CALL    PERXOR
2005 065436                     IF ABORTFLAG IS FALSE
     065436 005737 002142                                               TST ABORTFLAG
     065442 001002                                                      BNE L740
2006 065444 104014                ERROR +14
2007 065446                     ELSE
     065446 000401                                                      BR L741
     065450                                                     L740:;;;;;;
2008 065450 104015                ERROR +15
2009 065452                     END ;OF IF ABORTFLAG
     065452                                                     L741:;;;;;;
2010 065452 000002              RTI
```

```
2013 065454                            PERRA7: SUBTST  <<DATA WAS A 7 BIT BYTE>>
                                       ;*************************************************************************
                                       ;*SUBTEST       DATA WAS A 7 BIT BYTE
                                       ;*************************************************************************
2014 065454                                    IF BADPC EQ #0 THEN $CALL BADSTACK
     065454  005737  002026                                                        TST BADPC
     065460  001002                                                                BNE L742
     065462  004737  036770                                                        JSR PC,BADSTACK
     065466                                                                 L742:::::::
2015 065466  004737  065540                    CALL    PERXOR
2016 065472  004737  065564                    CALL    PERBNK
2017 065476  104022                           ERROR   +22
2018 065500  000002                           RTI
2019
2020 065502                            $PER26: LET GOOD2 :  #100000
     065502  012737  100000  002052                                                MOV #100000,GOOD2
2021 065510                                    LET GOOD3 :  #100
     065510  012737  000100  002054                                                MOV #100,GOOD3
2022 065516  000137  054652                    JMP PERRA3
2023
2024 065522  005037  002052            $PER27: CLR     GOOD2
2025 065526                                    LET GOOD3 :- #077
     065526  012737  000077  002054                                                MOV #077,GOOD3
2026 065534  000137  054652                    JMP PERRA3
2027
2028 065540                            PERXOR: SUBTST  <<DETERMINE XOR OF GOOD & BAD>>
                                       ;*************************************************************************
                                       ;*SUBTEST       DETERMINE XOR OF GOOD & BAD
                                       ;*************************************************************************
2029 065540                                    PUSH    R0
     065540  010046                                                                MOV R0,-(SP)
2030 065542  013700  002050                    MOV     GOOD,R0
2031 065546  013737  002056  002064            MOV     BAD,BADXOR
2032 065554  074037  002064                    XOR     R0,BADXOR
2033 065560                                    POP     R0
     065560  012600                                                                MOV (SP)+,R0
2034 065562  000207                           RETURN
```

```
                        PERBNK: SUBTST<<LOG ERROR ON BAD BANK>>
                        ;*****************************************************************************
                        ;*SUBTEST       LOG ERROR ON BAD BANK
                        ;*****************************************************************************
                                ;WHILE WE'RE HERE LET'S MARK THE BAD BANK IN THE CONFIGURATION TABLE
                                PUSH    R0,R1                                   MOV R0,-(SP)
                                                                                MOV R1,-(SP)
                                MOV     BANK,R1
                                MUL     #6,R1
                                BIS     #BIT11,CONFIG(R1)
                                ADD     #5,R1           ;POINT TO MAX ERROR BYTE
                                INCB    CONFIG(R1)      ;BUMP BANK COUNTER
                                BNE     12$             ;NO OVERFLOW - SKIP
                                DECB    CONFIG(R1)      ;SET BACK TO 255.
                        12$:    CMPB    CONFIG(R1),ERRMAX       ;IS IT PAST MAX?
                                BLOS    11$             ;NO - SKIP
                                SET     TOOMANY         ;YES
                                                                                MOV  #-1,TOOMANY
                        11$:    POP     R1,R0                                   MOV (SP)+,R1
                                                                                MOV (SP)+,R0
                                RETURN
                        PERECC: MOV     R1,ADDRESS
                                MOV     R0,BAD
                                IF R1 EQ TESTADD                                CMP R1,TESTADD
                                                                                BNE L743
                                  MOV TSTDAT,GOOD
                                ELSE                                            BR L744
                                                                        L743:::::::
                                  MOV   TSTDAT+2,GOOD
                                END ;OF IF R1
                                                                        L744:::::::
                                CALL    PERXOR
                                SET     HEADER                                  MOV  #-1,HEADER
                                RETURN
                        $PER3': IF BADPC EQ #0 THEN $CALL BADSTACK              TST BADPC
                                                                                BNE L745
                                                                                JSR PC,BADSTACK
                                                                        L745:::::::
                                CALL    PERECC
                                IF REALPAT EQ #11                               CMP REALPAT,#11
                                                                                BNE L746
                                  ERROR +42
                                END ;OF IF REALPAT
                                                                        L746:::::::
                                IF REALPAT EQ #14                               CMP REALPAT,#14
                                                                                BNE L747
                                  ERROR +45
```

```
2071 065762                                  END ;OF IF REALPAT
     065762                                                          L747:::::::
2072 065762                                  IF REALPAT EQ #15
     065762  023727  002366  000015                                      CMP REALPAT,#15
     065770  001001                                                     BNE L750
2073 065772  104046                            ERROR +46
2074 065774                                  END ;OF IF REALPAT
     065774                                                          L750:::::::
2075 065774                                  IF REALPAT EQ #16
     065774  023727  002366  000016                                      CMP REALPAT,#16
     066002  001001                                                     BNE L751
2076 066004  104047                            ERROR +47
2077 066006                                  END ;OF IF REALPAT
     066006                                                          L751:::::::
2078 066006                                  SET HEADER
     066006  012737  177777  002724                                      MOV  #-1,HEADER
2079 066014  000002                          RTI
```

```
2082 066016                        $PER32: IF BADPC EQ #0 THEN $CALL BADSTACK
     066016 005737 002026                                                    TST BADPC
     066022 001002                                                           BNE L752
     066024 004737 036770                                                    JSR PC,BADSTACK
     066030                                                          L752:::::::
2083 066030 010137 002040                  MOV     R1,ADDRESS
2084 066034 010037 002056                  MOV     R0,BAD
2085 066040 010237 002050                  MOV     R2,GOOD
2086 066044                                SET     HEADER
     066044 012737 177777 002724                                            MOV  #-1,HEADER
2087 066052 104043                         ERROR   +43
2088 066054                                SET     HEADER
     066054 012737 177777 002724                                            MOV  #-1,HEADER
2089 066062 000002                         RTI
2090
2091 066064                        $PER33: IF BADPC EQ #0 THEN $CALL BADSTACK
     066064 005737 002026                                                    TST BADPC
     066070 001002                                                           BNE L753
     066072 004737 036770                                                    JSR PC,BADSTACK
     066076                                                          L753:::::::
2092 066076 010137 002040                  MOV     R1,ADDRESS
2093 066102 010037 002056                  MOV     R0,BAD
2094 066106 105037 002057                  CLRB    BAD+1
2095 066112 012737 000377 002050           MOV     #377,GOOD
2096 066120 004737 065540                  CALL    PERXOR
2097 066124                                SET     HEADER
     066124 012737 177777 002724                                            MOV  #-1,HEADER
2098 066132 104044                         ERROR   +44
2099 066134                                SET     HEADER
     066134 012737 177777 002724                                            MOV  #-1,HEADER
2100 066142 000002                         RTI
2101
2102 066144                        $PER34:IF BADPC EQ #0 THEN $CALL BADSTACK
     066144 005737 002026                                                    TST BADPC
     066150 001002                                                           BNE L754
     066152 004737 036770                                                    JSR PC,BADSTACK
     066156                                                          L754:::::::
2103 066156                                IF #BIT15!BIT4 OFF.IN CSR
     066156 032737 100020 002144                                            BIT #BIT15!BIT4,CSR
     066164 001002                                                          BNE L755
2104 066166 104016                           ERROR +16                 ;NO SBE OR DBE
2105 066170                                ELSE
     066170 000401                                                          BR L756
     066172                                                          L755:::::::
2106 066172 104001                           ERROR +1                  ;EXPECTED SBE SO DBE MUST HAVE GOTTEN SET
2107 066174                                END ;OF IF #BIT15.BIT4
     066174                                                          L756:::::::
2108 066174 000002                         RTI
2109
2110                                       ;DURING BRANCH GOBBLE THE CONDITION CODES WERE WRONG
2111 066176 004737 065564          $PER35: CALL    PERBNK
2112 066202 004737 036770                  CALL    BADSTACK
2113 066206 013737 002036 002056           MOV     BADPSW,BAD
2114 066214 012737 000012 002050           MOV     #12,GOOD
2115 066222 104054                         ERROR   +54
2116 066224 062706 000004                  ADD     #4,SP             ;FIX STACK FROM TRAP
2117 066230 000207                         RETURN                    ;ABORTING TEST
```

```
2120                                    .SBTTL  ROUTINE SCOPE HANDLER
2121                                ;*****************************************************************************
2122                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
2123                                ;*AND LOAD THE DISPLAY DATA INTO THE DISPLAY REGISTER
2124                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
2125                                ;*SW14=1         LOOP ON TEST
2126                                ;*SW9=1 LOOP ON ERROR
2127                                ;*CALL
2128                                ;*      SCOPE               ;;SCOPE IOT
2129 066232  005237  075144        $SCOPE: INC     $DEVCT          ;TELL APT WE ARE ALIVE
2130 066236                                IF RESULT IS LT
      066236  002004                                                                    BGE L757
2131 066240  005037  075144                 CLR   $DEVCT
2132 066244  105237  075146                 INCB  $UNIT
2133 066250                                END ;OF IF RESULT
      066250                                                                    L757:::::::
2134 066250  104410                        CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
2135 066252                                IF CPUBIT EQ #MASTER    ;IF I'M THE MASTER
      066252  023727  002114  000020                                            CMP CPUBIT,#MASTER
      066260  001016                                                            BNE L760
2136 066262                                  IF PTYFLAG IS TRUE OR PTYFLAG+2 IS TRUE OR PTYFLAG+4 IS TRUE OR PTYFLAG+6 IS TRUE
      066262  005737  002626                                                    TST PTYFLAG
      066266  001011                                                            BNE L761
      066270  005737  002630                                                    TST PTYFLAG+2
      066274  001006                                                            BNE L761
      066276  005737  002632                                                    TST PTYFLAG+4
      066302  001003                                                            BNE L761
      066304  005737  002634                                                    TST PTYFLAG+6
      066310  001402                                                            BEQ L762
      066312                                                            L761:::::::
2137 066312  004737  072154                     CALL QUE
2138 066316                                  END ;OF IF PTYFLAG
      066316                                                            L762:::::::
2139 066316                                END ;OF IF CPUBIT
      066316                                                            L760:::::::
2140 066316                                IF STOPOK IS TRUE AND #SW8 SET.IN @SWR
      066316  005737  002520                                                    TST STOPOK
      066322  001412                                                            BEQ L763
      066324  032777  000400  114434                                            BIT #SW8,@SWR
      066332  001406                                                            BEQ L763
2141 066334  005037  002520                   CLR   STOPOK
2142 066340                                  TYPE   MSG112          ;PROGRAM HALTING BECAUSE OF SWITCH #8
      066340  104401  117035                TYPEIT  ,MSG112
                                            .DSABL  CRF
2143 066344  000137  043522                   JMP   EXIT
2144 066350                                END ,OF IF STOPOK
      066350                                                            L763:::::::
2145 066350                                IF NOSCOPE IS TRUE
      066350  005737  002540                                                    TST NOSCOPE
      066354  001401                                                            BEQ L764
2146 066356  000002                           RTI
2147 066360                                END ;OF IF NOSCOPE
      066360                                                            L764:::::::
2148 066360                                1$:     IF #SW14 SET.IN @SWR THEN GOTO $OVER
      066360  032777  040000  114400                                            BIT #SW14,@SWR
      066366  001045                                                            BNE $OVER
2149                                ;#####START OF CODE FOR THE XOR TESTER#####
```

```
 2150 066370  000427                  $XTSTR: BR      2$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
 2151                                                                 ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
 2152 066372  013746  000004                  MOV     ERRVEC,-(SP)    ;;SAVE THE CONTENTS OF THE ERROR VECTOR
 2153 066376  012737  066416  000004          MOV     #1$,ERRVEC      ;;SET FOR TIMEOUT
 2154 066404  005737  177060                  TST     177060  ;;TIME OUT ON XOR?
 2155 066410  012637  000004                  MOV     (SP)+,ERRVEC    ;;RESTORE THE ERROR VECTOR
 2156 066414  000424                          BR      $SVLAD          ;;GO TO THE NEXT TEST
 2157 066416  062706  000004          1$:     ADD     #4,SP           ;FIX STACK FROM TRAP
 2158 066422  005037  177766                  CLR     CPUERR          ;RESET CPU ERROR REGISTER
 2159 066426  012637  000004                  MOV     (SP)+,ERRVEC    ;;RESTORE THE ERROR VECTOR
 2160 066432  000407                          BR      4$              ;;LOOP ON THE PRESENT TEST
 2161 066434                          2$:;#####END OF CODE FOR THE XOR TESTER#####
 2162 066434  105737  002016          3$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
 2163 066440  001412                          BEQ     $SVLAD          ;;BR IF NO
 2164 066442  032777  001000  114316          BIT     #SW9,@SWR       ;;LOOP ON ERROR?
 2165 066450  001404                          BEQ     5$              ;;BR IF NO
 2166 066452  013737  002750  002746  4$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
 2167 066460  000410                          BR      $OVER
 2168 066462  105037  002016          5$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
 2169 066466  011637  002746          $SVLAD: MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
 2170 066472  011637  002750                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
 2171 066476  005037  002454                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
 2172 066502  004737  066514          $OVER:  CALL    GETDIS
 2173 066506  013716  002746                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
 2174 066512  000002                          RTI                     ;;FIXES PS
```

```
 2176 066514                            GETDIS. SUBTST  <<SUBR  DISPLAY>>
                                        ;*****************************************************************************
                                        ;*SUBTEST        SUBR    DISPLAY
                                        ;*****************************************************************************
 2177 066514  113737  002106  002015            MOVB    BANK,$BANK
 2178 066522  113737  002366  002014            MOVB    REALPAT,$PATMAR
 2179 066530                                    PUSH    R0,4
      066530  010046                                                                    MOV R0,-(SP)
      066532  013746  000004                                                          MOV 4,-(SP)
 2180 066536                                    SET4    #2$             ;TRAPS TO 4 GOTO 2$
      066536  012737  066560  000004            MOV     #2$,4
                                              .DSABL  CRF
 2181 066544  005000                            CLR     R0
 2182 066546  013700  177750                    MOV     MAINT,R0
 2183 066552  072027  000004                    ASH     #4,R0
 2184 066556  000402                            BR      3$
 2185 066560  062706  000004            2$:     ADD     #4,SP                   ;FIX STACK FROM TRAP
 2186 066564  042700  177437            3$:     BIC     #^C340,R0
 2187 066570  150037  002014                    BISB    R0,$PATMAR
 2188 066574  005737  002134                    TST     RLFLAG                  ;ARE WE RELOCATED?
 2189 066600  001403                            BEQ     1$                      ;NO - SKIP
 2190 066602  052737  100000  002014            BIS     #BIT15,$PATMAR          ;YES - SET MSB
 2191 066610                            1$:     IF MDISPLAY NE #0 THEN LET $PATMAR :  MDISPLAY
      066610  005737  002676                                                          TST MDISPLAY
      066614  001403                                                                 BEQ L765
      066616  013737  002676  002014                                                 MOV MDISPLAY,$PATMAR
      066624                                                                 L765:::::::
 2192 066624  013777  002014  114136            MOV     $PATMAR,@DISPLAY
 2193 066632  013737  002014  000174            MOV     $PATMAR,DISPREG         ;SOFTWARE DISPLAY REGISTER
 2194 066640                                    POP     4,R0
      066640  012637  000004                                                          MOV (SP)+,4
      066644  012600                                                                 MOV (SP)+,R0
 2195 066646                                    RES4                            ;RESTORE TRAPS TO 4 TO DEFAULT
      066646  012737  036726  000004            MOV     #TIMEOUT,4
      066654  005037  177766                    CLR     CPUERR          ;CLEAR OUT THE CPU ERROR REGISTER BITS
                                                                             ;THAT A EXPECTED TRAP COULD HAVE SET
                                              .DSABL  CRF
 2196 066660  000207                            RETURN
```

```
                                        .SBTTL  ROUTINE ERROR HANDLER
                                ;*****************************************************************************
                                ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                ;*AND GO TO $ERRTYP ON ERROR
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW15=1         HALT ON ERROR
                                ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                ;*SW10=1         BELL ON ERROR
                                ;*SW9=1 LOOP ON ERROR
                                ;*CALL
                                ;*      ERROR   N       ;;ERROR EMT AND N ERROR ITEM NUMBER
                                
                                        .ENABL  LSB
066662                          $ERROR: IF NOERROR IS FALSE                                             TST NOERROR
066662  005737  002530                                                                                  BNE L766
066666  001027
066670  104410                            CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
066672  105237  002016              1$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
066676  001775                            BEQ     1$              ;;DON'T LET THE FLAG GO TO ZERO
066700  004737  066514                    CALL    GETDIS          ;SETUP DISPLAY STUFF
066704  013737  002014  075140            MOV     $PATMAR,$TESTN  ;FOR APT
066712  032777  002000  114046            BIT     #SW10,@SWR      ;;BELL ON ERROR?
066720  001404                            BEQ     2$              ;;NO - SKIP
066722                                    TYPE    $BELL           ;;RING BELL
066722  104401  003003                  TYPEIT  ,$BELL
                                        .DSABL  CRF
066726                                    TYPE    MSG014          ;CONTROL Z
066726  104401  112132                  TYPEIT  ,MSG014
                                        .DSABL  CRF
066732  005237  002754              2$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
066736                                    IF RESULT IS MI                                                 BPL L767
066736  100003
066740  012737  077777  002754              MOV #77777,$ERTT
066746                                    END ;OF IF RESULT
066746                                                                                          L767:::::::
066746                                  END ;OF IF NOERROR
066746                                                                                          L766:::::::
066746  011637  002024                  MOV     (SP),ERRPC      ;;GET ADDRESS OF ERROR INSTRUCTION
066752  162737  000002  002024          SUB     #2,ERRPC
066760  010637  002030                  MOV     SP,ERRSP
066764  016637  000002  002034          MOV     2(SP),ERRPSW
066772  117737  113026  002017          MOVB    @ERRPC,$ITEMB   ;;STRIP AND SAVE THE ERROR ITEM CODE
067000                                  IF NOERROR IS FALSE                                             TST NOERROR
067000  005737  002530                                                                                  BNE L770
067004  001044
067006                                    IF BADPC NE #0                                                TST BADPC
067006  005737  002026                                                                                  BEQ L771
067012  001416
067014  013737  002026  002024              MOV BADPC,ERRPC
067022  162737  000002  002024              SUB #2,ERRPC
067030  013737  002032  002030              MOV BADSP,ERRSP
067036  013737  002036  002034              MOV BADPSW,ERRPSW
067044  005037  002026                      CLR BADPC
067050                                    END ;IF
067050                                                                                          L771:::::::
067050  013737  002024  075136            MOV     ERRPC,$FATAL    ;FOR APT
```

```
2242 067056                                  IF #SW13 SET.IN @SWR OR SLAVERROR IS TRUE
     067056  032777  020000  113702                                          BIT #SW13,@SWR
     067064  001003                                                         BNE L772
     067066  005737  002570                                                 TST SLAVERROR
     067072  001401                                                         BEQ L773
     067074                                                              L772::::::
2243 067074  000412                              BR  3$
2244 067076                                  END ;OF IF #SW13
     067076                                                              L773::::::
2245 067076                                  IF #SW5 SET.IN @SWR AND TOOMANY IS TRUE
     067076  032777  000040  113662                                          BIT #SW5,@SWR
     067104  001404                                                         BEQ L774
     067106  005737  002472                                                 TST TOOMANY
     067112  001401                                                         BEQ L774
2246 067114                                    GOTO 3$
     067114  000402                                                         BR 3$
2247 067116                                  END ;OF IF #SW5
     067116                                                              L774::::::
2248 067116                                END ;OF IF NOERROR
     067116                                                              L770::::::
2249 067116  004737  067324                 CALL    $ERRTYP          ;;GO TO USER ERROR ROUTINE
```

```
2251 067122                            3$:     IF NOERROR IS FALSE                                                     TST NOERROR
     067122  005737  002530                                                                                            BNE L775
     067126  001064
2252 067130  005777  113632                      TST   @SWR             ;;HALT ON ERROR
2253 067134  100002                              BPL   7$               ;;SKIP IF CONTINUE
2254 067136  000000                    $HALT:    HALT                   ;;HALT ON ERROR!
2255 067140  104410                              CKSWR                  ;;TEST FOR CHANGE IN SOFT-SWR
2256 067142                            7$:       IF NOSCOPE IS FALSE AND #SW9 SET.IN @SWR
     067142  005737  002540                                                                                            TST NOSCOPE
     067146  001006                                                                                                    BNE L776
     067150  032777  001000  113610                                                                                    BIT #SW9,@SWR
     067156  001402                                                                                                    BEQ L776
2257 067160  013716  002750                        MOV $LPERR,(SP)      ;;FUDGE RETURN FOR LOOPING
2258 067164                                      END ;OF IF NOSCOPE
     067164                                                                                                  L776:::::::
2259 067164  005737  002454                      TST   $ESCAPE          ;;CHECK FOR AN ESCAPE ADDRESS
2260 067170  001402                              BEQ   9$               ;;BR IF NONE
2261 067172  013716  002454                      MOV   $ESCAPE,(SP)     ;;FUDGE RETURN ADDRESS FOR ESCAPE
2262 067176                            9$:       IF DETFLAG IS FALSE
     067176  005737  002326                                                                                            TST DETFLAG
     067202  001035                                                                                                    BNE L777
2263 067204                                      IF ACTFLAG IS TRUE OR APTFLAG IS TRUE OR FATAL$ IS TRUE
     067204  005737  002442                                                                                            TST ACTFLAG
     067210  001006                                                                                                    BNE L1000
     067212  005737  002444                                                                                            TST APTFLAG
     067216  001003                                                                                                    BNE L1000
     067220  005737  002070                                                                                            TST FATAL$
     067224  001405                                                                                                    BEQ L1001
     067226                                                                                                  L1000:::::::
2264 067226  012737  000001  075134                  MOV     #1,$MSGTY      ;FOR APT
2265 067234  000137  043522                          JMP     EXIT
2266 067240                                        END ;OF IF ACTFLAG
     067240                                                                                                  L1001:::::::
2267 067240                                        IF XXDPCHAIN IS TRUE AND $ERTTL HI #20
     067240  005737  002446                                                                                            TST XXDPCHAIN
     067244  001414                                                                                                    BEQ L1002
     067246  023727  002754  000020                                                                                    CMP $ERTTL,#20
     067254  101410                                                                                                    BLOS L1002
2268 067256                                          TYPE    MSG066       ;ERROR COUNT EXCEEDED 20 - ABORTING FOR XXDP CHAIN
     067256  104401  115142                    TYPEIT  ,MSG066
                                               .DSABL  CRF
2269 067262  013700  000042                          MOV     42,R0
2270 067266  005037  000042                          CLR     42
2271 067272  000137  014760                          JMP     $ZAP42
2272 067276                                        END ;OF IF XXDPCHAIN
     067276                                                                                                  L1002:::::::
2273 067276                                      END ;OF IF DETFLAG
     067276                                                                                                  L777:::::::
2274 067276                                      ELSE
     067276  000403                                                                                                    BR L1003
     067300                                                                                                  L775:::::::
2275 067300                                        SET   HEADER
     067300  012737  177777  002724                                                                                    MOV  #-1,HEADER
2276 067306                                      END ;OF IF NOERROR
     067306                                                                                                  L1003:::::::
2277 067306                            10$:      CLEAR   TOOMANY,CPUERR,NOERROR
     067306  005037  002472                                                                                            CLR  TOOMANY
```

```
        067312  005037  177766
        067316  005037  002530                                          .R    .PUERR
        067322  000002                                                  .R    NOERROR
2278                            RTI                     ::RETURN
2279                            .DSABL  LSB
```

```
                                        .SBTTL  ROUTINE ERROR MESSAGE TYPEOUT

                                ;*********************************************************************
                                ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                                ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
                                ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

067324  104415          $ERRTYP:SAVREG
067326                          TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
067326  104401  003010          TYPEIT  ,$CRLF
                                .DSABL  CRF
067332  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
067334  153700  002017          BISB    $ITEMB,R0
067340  001004                  BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                        ;;TYPE THE PC OF THE ERROR
067342                          TYPOCT  ERRPC,<ERROR ADDRESS>
067342  013746  002024          MOV     ERRPC,-(SP)     ;;SAVE ERRPC FOR TYPEOUT
                                                        ;;ERROR ADDRESS
067346  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                .DSABL  CRF
067350  000512                  BR      11$             ;;GET OUT
067352  005300          1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
067354  006300                  ASL     R0              ;;      WORK FOR THE ERROR TABLE
067356  006300                  ASL     R0
067360  006300                  ASL     R0
067362  062700  101372          ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
067366  012037  067424          MOV     (R0)+,3$        ;;PICKUP "ERROR MESSAGE" POINTER
067372  001417                  BEQ     4$              ;;SKIP TYPEOUT IF NO POINTER
067374  005737  002530          TST     NOERROR         ;IS THIS REALLY AN ERROR?
067400  001003                  BNE     12$             ;YES - SKIP
067402  005737  002724          TST     HEADER          ;TYPE HEADER?
067406  100011                  BPL     4$              ;NO - SKIP
067410  005737  002070  12$:    TST     FATAL$          ;WAS IT A FATAL ERROR?
067414  001402                  BEQ     2$              ;NO - SKIP
067416                          TYPE    MSG067          ;FATAL
067416  104401  115225          TYPEIT  ,MSG067
                                .DSABL  CRF
067422                  2$:     TYPE                    ;;TYPE THE "ERROR MESSAGE"
067422  104401                  TYPEIT
                                .DSABL  CRF
067424  000000          3$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
067426                          TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
067426  104401  003010          TYPEIT  ,$CRLF
                                .DSABL  CRF
067432  012037  067456  4$:     MOV     (R0)+,5$        ;;PICKUP "DATA HEADER" POINTER
067436  001412                  BEQ     6$              ;;SKIP TYPEOUT IF 0
067440  005737  002530          TST     NOERROR         ;IS THIS REALLY AN ERROR?
067444  001003                  BNE     13$             ;YES - SKIP
067446  005737  002724          TST     HEADER          ;TYPE HEADER?
067452  100004                  BPL     6$              ;NO - SKIP
067454                  13$:    TYPE                    ;;TYPE THE "DATA HEADER"
067454  10440'                  TYPEIT
                                .DSABL  CRF
067456  000000          5$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
067460                          TYPE    $CRLF           ;;"CARRIAGE RETURN" & "LINE FEED"
067460  104401  003010          TYPEIT  ,$CRLF
                                .DSABL  CRF
```

```
 2323 067464  012001          6$:     MOV     (R0)+,R1        ;;PICKUP 'DATA TABLE'' POINTER
 2324 067466  001436                  BEQ     10$             ;;BR IF NO DATA TO BE TYPED
 2325 067470  012002                  MOV     (R0)+,R2        ;;PICKUP 'DATA FORMAT'' POINTER
```

```
2328 067472 112203                  7$:     MOVB    (R2)+,R3
2329 067474 006303                          ASL     R3              ;MAKE IT A WORD ADDRESS
2330 067476 004773 067504                   CALL    @8$(R3)
2331 067502 000421                          BR      9$
2332 067504 067636                  8$:     TAG70$
2333 067506 067646                          TAG71$
2334 067510 067656                          TAG72$
2335 067512 067722                          TAG73$
2336 067514 067730                          TAG74$
2337 067516 067742                          TAG75$
2338 067520 067754                          TAG76$
2339 067522 067776                          TAG77$
2340 067524 070000                          TAG78$
2341 067526 070006                          TAG79$
2342 067530 070066                          TAG80$
2343 067532 070100                          TAG81$
2344 067534 070122                          TAG82$
2345 067536 070324                          TAG83$
2346 067540 070410                          TAG84$
2347 067542 070502                          TAG85$
2348 067544 070612                          TAG86$
2349 067546 062701 000002           9$:     ADD     #2,R1           ;UPDATE DATA TABLE POINTER
2350 067552 005711                          TST     (R1)            ;;IS THERE ANOTHER NUMBER?
2351 067554 001403                          BEQ     10$             ;;BR IF NO
2352 067556                                 TYPE    MSG018          ;TYPE 2 SPACES
     067556 104401 112161                   TYPEIT  ,MSG018
                                            .DSABL  CRF
2353 067562 000743                          BR      7$              ;;LOOP
2354
2355 067564 005737 002116           10$:    TST     MUT             ;IS THERE A MEMORY UNDER TEST
2356 067570 001402                          BEQ     11$             ;NO - SKIP
2357 067572 005237 002724                   INC     HEADER          ;YES - BUMP HEADER FLAG
2358 067576 104416                  11$:    RESREG
2359 067600                                 IF #SW7 SET.IN @SWR AND DETFLAG IS FALSE AND NOERROR IS FALSE
     067600 032777 000200 113160                                                    BIT #SW7,@SWR
     067606 001410                                                                  BEQ L1004
     067610 005737 002326                                                           TST DETFLAG
     067614 001005                                                                  BNE L1004
     067616 005737 002530                                                           TST NOERROR
     067622 001002                                                                  BNE L1004
2360 067624 004737 071364                     CALL  DETAIL
2361 067630                                 END ;OF IF #SW7
     067630                                                             L1004:;;;;;;
2362 067630                                 TYPE    MSG104          ;CONTROL Z
     067630 104401 116421                   TYPEIT  ,MSG104
                                            .DSABL  CRF
2363 067634 000207                          RETURN
```

```
2366                                    ;*****************************************************************************
2367                                    ;*** OCTAL ***
2368                                    ;*****************************************************************************
2369 067636                            TAG70$: TYPOCT  @(R1)           ;;TYPE AN OCTAL NUMBER
     067636  017146  000000                    MOV     @(R1),-(SP)     ;;SAVE @(R1) FOR TYPEOUT
     067642  104402                            TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                                .DSABL  CRF
2370 067644  000207                            RETURN
2371
2372                                    ;*****************************************************************************
2373                                    ;*** DECIMAL ***
2374                                    ;*****************************************************************************
2375 067646                            TAG71$: TYPDEC  @(R1)           ;;TYPE A DECIMAL NUMBER
     067646  017146  000000                    MOV     @(R1),-(SP)     ;;SAVE @(R1) FOR TYPEOUT
     067652  104405                            TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                                .DSABL  CRF
2376 067654  000207                            RETURN
2377
2378                                    ;*****************************************************************************
2379                                    ;*** INTERLEAVE ***
2380                                    ;*****************************************************************************
2381 067656                            TAG72$: PUSH    R1,R5                                   MOV R1,-(SP)
     067656  010146                                                                            MOV R5,-(SP)
     067660  010546
2382 067662  013701  002106                    MOV     BANK,R1
2383 067666  070127  000006                    MUL     #6,R1
2384 067672                                    SET     NOTAB                   ;INDICATE NO TABLE TO BE PRINTED - NOW
     067672  012737  177777  002464                                            MOV  #-1,NOTAB
2385 067700  004737  036012                    CALL    TCFIG1
2386 067704  005037  002464                    CLR     NOTAB
2387 067710                                    POP     R5,R1
     067710  012605                                                            MOV (SP)+,R5
     067712  012601                                                            MOV (SP)+,R1
2388 067714                                    TYPE    MSG014                  ;1 SPACE
     067714  104401  112132                    TYPEIT  ,MSG014
                                                .DSABL  CRF
2389 067720  000207                            RETURN
2390
2391                                    ;*****************************************************************************
2392                                    ;*** BOX ***
2393                                    ;*****************************************************************************
2394 067722  004737  070672            TAG73$: CALL    WHOBOX
2395 067726  000207                            RETURN
2396
2397                                    ;*****************************************************************************
2398                                    ;*** PATTERN ***
2399                                    ;*****************************************************************************
2400 067730                            TAG74$: TYPOCS  REALPAT,<TYPE (0-77)>,2,Z
     067730  013746  002366                    MOV     REALPAT,-(SP)   ;;SAVE REALPAT FOR TYPEOUT
                                                                        ;;TYPE (0-77)
     067734  104403                            TYPOS                   ;;GO TYPE--OCTAL ASCII
     067736     002                            .BYTE   2               ;;TYPE 2 DIGIT(S)
     067737     001                            .BYTE   1               ;;TYPE LEADING ZEROS
                                                .DSABL  CRF
2401 067740  000207                            RETURN
2402
2403                                    ;*****************************************************************************
```

```
                                        ;*** BANK ***
                                        ;*************************************************************************
067742                                  TAG75$: TYPOCS  BANK,<TYPE (0-167)>,3
067742  013746  002106                          MOV     BANK,-(SP)      ;;SAVE BANK FOR TYPEOUT
                                                                        ;;TYPE (0-167)
067746  104403                                  TYPOS                   ;;GO TYPE--OCTAL ASCII
067750     003                                  .BYTE   3               ;;TYPE 3 DI IT(S)
067751     000                                  .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                .DSABL  CRF
067752  000207                                  RETURN

                                        ;*************************************************************************
                                        ;*** MTYPE ***
                                        ;*************************************************************************
067754  005737  002126                  TAG76$: TST     MKFLAG
067760  001003                                  BNE     1$
067762                                          TYPE    MSG068          ;MJ11
067762  104401  115234                          TYPEIT  ,MSG068
                                                .DSABL  CRF
067766  000207                                  RETURN
067770                                  1$:     TYPE    MSG069          ;MK1
067770  104401  115241                          TYPEIT  ,MSG069
                                                .DSABL  CRF
067774  000207                                  RETURN
```

```
2420                                    ;*****************************************************************************
2421                                    ;*** SPARE FUNCTION ***
2422                                    ;*****************************************************************************
2423 067776  000207                     TAG77$: RETURN
2424
2425                                    ;*****************************************************************************
2426                                    ;*** UNKNOWN DATA ***
2427                                    ;*****************************************************************************
2428 070000                             TAG78$: TYPE    MSG061
     070000  104401  015060                     TYPEIT  ,MSG061
                                                .DSABL  CRF
2429 070004  000207                             RETURN
2430
2431                                    ;*****************************************************************************
2432                                    ;*** PHYSICAL ADDRESS ***
2433                                    ;*****************************************************************************
2434 070006  013737  002040  002044     TAG79$: MOV     ADDRESS,PHYADD
2435 070014  162737  060000  002044             SUB     #FIRST,PHYADD
2436 070022  013737  002106  002046             MOV     BANK,PHYADD+2
2437 070030  006237  002046                     ASR     PHYADD+2
2438 070034  103003                             BCC     1$
2439 070036  052737  100000  002044             BIS     #BIT15,PHYADD
2440 070044  012746  002044             1$:     MOV     #PHYADD,-(SP)           ;POINTER TO DOUBLE WORD ON STACK
2441 070050  004737  075014                     CALL    $D820                   ;CALL DOUBLE PRECISION CONVERSION ROUTINE
2442 070054  062706  000002                     ADD     #2,SP                   ;FIX STACK
2443 070060                                     TYPE    $OCT8
     070060  104401  075122                     TYPEIT  ,$OCT8
                                                .DSABL  CRF
2444 070064  000207                             RETURN
2445                                    ;*****************************************************************************
2446                                    ;*** MARGIN ***
2447                                    ;*****************************************************************************
2448 070066                             TAG80$: TYPOCS  MARGIN,<TYPE (0,2,3,4, OR 5)>,1
     070066  013746  002112                     MOV     MARGIN,-(SP)    ;;SAVE MARGIN FOR TYPEOUT
                                                                         ;;TYPE (0,2,3,4, OR 5)
     070072  104403                             TYPOS                   ;;GO TYPE--OCTAL ASCII
     070074     001                             .BYTE   1               ;;TYPE 1 DIGIT(S)
     070075     000                             .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                                .DSABL  CRF
2449 070076  000207                             RETURN
2450
2451                                    ;*****************************************************************************
2452                                    ;*** OCTAL BYTE ***
2453                                    ;*****************************************************************************
2454 070100                             TAG81$: TYPE    MSG018          ;2 SPACES
     070100  104401  112161                     TYPEIT  ,MSG018
                                                .DSABL  CRF
2455 070104                                     TYPOCS  @(R1),<TYPE BYTE>,3,Z
     070104  017146  000000                     MOV     @(R1),-(SP)     ;;SAVE @(R1) FOR TYPEOUT
                                                                         ;;TYPE BYTE
     070110  104403                             TYPOS                   ;;GO TYPE--OCTAL ASCII
     070112     003                             .BYTE   3               ;;TYPE 3 DIGIT(S)
     070113     001                             .BYTE   1               ;;TYPE LEADING ZEROS
                                                .DSABL  CRF
2456 070114                                     TYPE    MSG014          ;SPACE
     070114  104401  112132                     TYPEIT  ,MSG014
                                                .DSABL  CRF
```

'0 096'

```
2457 070120  000207                    RETURN
```

```
                                        ;*****************************************************************************
                                        ;*** ARRAY ***
                                        ;*****************************************************************************
                                        ;SOMETIMES THE ARRAY INFORMATION MAY BE MISLEADING
                                        ;  IF YOU ARE LOOKING FOR SBE'S (SWITCH 0 IS UP)
                                        ;    IF AN ERROR IS BEING REPORTED AND THE CODE THAT TYPES THE
                                        ;    ERROR HAS A SINGLE BIT ERROR
                                        ;      THE OLD SBE INFORMATION WILL BE WRITTEN OVER AND THE ARRAY
                                        ;      TYPED MAY BE THE ARRAY THAT HAS THE ERROR REPORT CODE IN IT
                                        ;      AND NOT THE ARRAY THAT WAS UNDER TEST AND THAT THE REST
                                        ;      OF THE ERROR REPORT IS TALKING ABOUT.
                                        ;      HOWEVER THE ARRAY IS STILL BAD (IF YOU'RE LOOKING FOR SBE'S).
070122  012737  037477  115336  TAG82$: MOV     #'??,MSG074
                                        IF MKFLAG IS TRUE
070130  005737  002126                                                  TST MKFLAG
070134  001470                                                          BEQ L1005
                                          PUSH  CSR,CSR+2,R0,R1,R2,CSRNO
070136                                                                  MOV CSR,-(SP)
070136  013746  002144                                                  MOV CSR+2,-(SP)
070142  013746  002146                                                  MOV R0,-(SP)
070146  010046                                                          MOV R1,-(SP)
070150  010146                                                          MOV R2,-(SP)
070152  010246                                                          MOV CSRNO,-(SP)
070154  013746  002256
070160  013737  002000  002256          MOV   BADCSR,CSRNO
070166                                  SET   R2
070166  012702  177777                                                  MOV  #-1,R2
070172  104426                          READCSR
070174                                  IF #BIT15.BIT4 SET.IN CSR
070174  032737  100020  002144                                          BIT #BIT15 BIT4,CSR
070202  001414                                                          BEQ L1006
                                          MOV CSR,R2
070204  013702  002144
070210  072227  177774                    ASH #-4,R2
070214  042702  177761                    BIC #^C16,R2
070220                                    IF #BIT9 SET.IN CSR+2 THEN LET R2 := R2 SET.BY #BIT0
070220  032737  001000  002146                                          BIT #BIT9,CSR+2
070226  001402                                                          BEQ L1007
070230  052702  000001                                                  BIS #BIT0,R2
070234                                                          L1007:::::::
                                        END ;OF IF #BIT15.BIT4
070234                                                          L1006:::::::
                                        IF R2 GE #0
070234  005702                                                          TST R2
070236  002416                                                          BLT L1010
                                          IF R2 GT #9.
070240  020227  000011                                                  CMP R2,#9.
070244  003406                                                          BLE L1011
                                            SUB       #10.,R2
070246  162702  000012
070252  000302                            SWAB      R2
070254  062702  030061                    ADD       #'10,R2
                                          ELSE
070260  000403                                                          BR L1012
070262                                                          L1011:::::::
                                            SWAB      R2
070262  000302
070264  062702  030040                    ADD       #'  0,R2
                                          END ;OF IF #BIT3
070270
070270  010237  115336                    MOV R2,MSG074                 L1012:::::::
```

```
2494 070274                                    END ;OF IF R2
     070274
2495 070274                                    POP    CSRND,R2,R1,R0,CSR+2,CSR
     070274  012637  002154
     070300  012602
     070302  012601
     070304  012600
     070306  012637  002146
     070312  012637  002144
2496 070316                                    END ;OF IF MKFLAG
     070316
2497 070316                                    TYPE    MSG074
     070316  104401  115336                   TYPEIT  ,MSG074
2498 070322  000207                           .DSABL  CRF
                                               RETURN

                                               L1010::::::
                                                       MOV (SP)+,CSRND
                                                       MOV (SP)+,R2
                                                       MOV (SP)+,R1
                                                       MOV (SP)+,R0
                                                       MOV (SP)+,CSR+2
                                                       MOV (SP)+,CSR

                                               L1005::::::
```

```
                        ;*****************************************************************************
                        ;*** BINARY BYTE ***
                        ;*****************************************************************************
070324                  TAG83$: PUSH    R0,R2
070324 010046                                                           MOV R0,-(SP)
070326 010246                                                           MOV R2,-(SP)
                                TYPE    MSG018          ;2 SPACES
070330 104401 112161            TYPEIT  ,MSG018
                                .DSABL  CRF
070334 017100 000000            MOV     @(R1),R0
                                FOR R2 :  #1 TO #8.
070340 012702 000001                                                    MOV #1,R2
070344                                                          B200:::::::
                                  ROLB  R0
                                  ON.ERROR
070346 103004                                                           BCC L1013
070350 112737 000061 112134       MOVB      #'1,MSG015
                                  ELSE
070356 000403                                                           BR L1014
070360                                                          L1013:::::::
070360 112737 000060 112134       MOVB      #'0,MSG015
                                  END ;OF ON.ERROR
070366                                                          L1014:::::::
                                  TYPE MSG015
070366 104401 112134            TYPEIT  ,MSG015
                                .DSABL  CRF
                                END ;OF FOR R2
070372 005202                                                           INC R2
070374 020227 000010                                                    CMP R2,#8.
070400 003761                                                           BLE B200
070402                                                          E200:::::::
                                POP     R2,R0
070402 012602                                                           MOV (SP)+,R2
070404 012600                                                           MOV (SP)+,R0
070406 000207                   RETURN

                        ;*****************************************************************************
                        ;*** 4 BINARY BITS ***
                        ;*****************************************************************************
070410                  TAG84$: PUSH    R0,R2
070410 010046                                                           MOV R0,-(SP)
070412 010246                                                           MOV R2,-(SP)
070414                          TYPE    MSG018          ;2 SPACES
070414 104401 112161            TYPEIT  ,MSG018
                                .DSABL  CRF
070420 017100 000000            MOV     @(R1),R0
070424 012702 000004            MOV     #4,R2
070430 072002                   ASH     R2,R0           ;SHIFT 4 PLACES LEFT
070432                          FOR R2 := #1 TO #4
070432 012702 000001                                                    MOV #1,R2
070436                                                          B201:::::::
070436 106100                     ROLB  R0
                                  ON.ERROR
070440 103004                                                           BCC L1015
070442 112737 000061 112134       MOVB      #'1,MSG015
                                  ELSE
070450 000403                                                           BR L1016
```

```
       070452                                                     L1015::;;..;;
 2532  070452  112737  000060  112134      MOVB      #'0,MSG015
 2533  070460                              END ;OF ON.ERROR
       070460                                                     L1016:;;;;;;
 2534  070460                              TYPE   MSG015
       070460  104401  112134            TYPEIT   .MSG015
                                         .DSABL   CRF
 2535  070464                            END ;OF FOR R2
       070464  005202                                                     INC R2
       070466  020227  000004                                             CMP R2,#4
       070472  003761                                                     BLE B201
       070474                                                     E201:;;;;;;;;
 2536  070474                            POP      R2,R0
       070474  012602                                                     MOV (SP)+,R2
       070476  012600                                                     MOV (SP)+,R0
 2537  070500  000207                    RETURN
```

```
                                ;*****************************************************************************
                                ;*** ARRAY FROM SBE FROM OLD CSR ***
                                ;*****************************************************************************
070502                          TAG85$: PUSH    R2                                              MOV R2,-(SP)
070502  010246
070506  012737  037477  115336        MOV     #'??,MSG074
070514  013702  002150                MOV     SBECSR,R2
070520  072227  177774                ASH     #-4,R2
070524  042702  177761                BIC     #^C16,R2
070526                                IF #BIT9 SET.IN SBECSR+2 THEN LET R2 := R2 SET.BY #BIT0
070526  032737  001000  002152                                                                  BIT #BIT9,SBECSR+2
070534  001402                                                                                  BEQ L1017
070536  052702  000001                                                                         BIS #BIT0,R2
070542                                                                                  L1017:;;;;;
070542                                IF R2 GE #0
070542  005702                                                                                 TST R2
070544  002416                                                                                 BLT L1020
070546                                  IF R2 GT #9.
070546  020227  000011                                                                         CMP R2,#9.
070552  003406                                                                                 BLE L1021
070554  162702  000012                    SUB #10.,R2
070560  000302                            SWAB    R2
070562  062702  030061                    ADD #'10,R2
070566                                  ELSE
070566  000403                                                                                 BR L1022
070570                                                                                  L1021:;;;;;;
070570  000302                            SWAB    R2
070572  062702  030040                    ADD #' 0,R2
070576                                  END ;OF IF #BIT3
070576                                                                                  L1022:;;;;;;
070576  010237  115336                  MOV   R2,MSG074
070602                                END ;OF IF R2
070602                                                                                  L1020:;;;;;;
070602                                TYPE    MSG074
070602  104401  115336                TYPEIT  ,MSG074
                                      .DSABL  CRF
070606                                POP     R2
070606  012602                                                                                 MOV (SP)+,R2
070610  000207                        RETURN
                                ;*****************************************************************************
                                ;*** MASTER OR SLAVE1 OR SLAVE2 OR SLAVE3 FROM BAD
                                ;*****************************************************************************
070612                          TAG86$: IF BAD EQ #0
070612  005737  002056                                                                         TST BAD
070616  001002                                                                                 BNE L1023
070620                                  TYPE  MSG113                  ;MASTER
070620  104401  117103                TYPEIT  ,MSG113
                                      .DSABL  CRF
070624                                END IF
070624                                                                                  L1023:;;;;;;
070624                                IF BAD EQ #1
070624  023727  002056  000001                                                                 CMP BAD,#1
070632  001002                                                                                 BNE L1024
070634                                  TYPE  MSG114                  ;SLAVE1
070634  104401  117113                TYPEIT  ,MSG114
                                      .DSABL  CRF
```

```
 2572 070640                                    END IF
      070640
 2573 070640                                    IF BAD EQ #2                                    L1024::::::
      070640  023727  002056  000002                                                                    CMP BAD,#2
      070646  001002                                                                                    BNE L1025
 2574 070650                                      TYPE  MSG115                  ;SLAVE2
      070650  104401  117123                     TYPEIT  ,MSG115
                                                 .DSABL  CRF
 2575 070654                                    END IF
      070654
 2576 070654                                    IF BAD EQ #3                                    L1025::::::
      070654  023727  002056  000003                                                                    CMP BAD,#3
      070662  001002                                                                                    BNE L1026
 2577 070664                                      TYPE  MSG116                  ;SLAVE3
      070664  104401  117133                     TYPEIT  ,MSG116
                                                 .DSABL  CRF
 2578 070670                                    END IF
      070670
 2579 070670  000207                            RETURN                                          L1026::::::
```

```
2581 070672                        WHOBOX: SUBTST  <<SUBR  WHO'S BOX IS THIS?>>
                                   ;*****************************************************************************
                                   ;*SUBTEST        SUBR    WHO'S BOX IS THIS?
                                   ;*****************************************************************************
2582 070672  005737  002126               TST     MKFLAG          ;MK11?
2583 070676  001003                       BNE     1$                      ;YES - SKIP
2584                                      ;NO - MJ11 - DON'T KNOW ABOUT BOX NUMBERS
2585 070700                               TYPE    MSG057                  ; ?
     070700  104401  114716               TYPEIT  ,MSG057
                                           .DSABL  CRF
2586 070704  000207                       RETURN
2587
2588 070706                        1$:    PUSH    CSRNO,R1,R2,R3,R4
     070706  013746  002256                                                      MOV CSRNO,-(SP)
     070712  010146                                                            MOV R1,-(SP)
     070714  010246                                                            MOV R2,-(SP)
     070716  010346                                                            MOV R3,-(SP)
     070720  010446                                                            MOV R4,-(SP)
2589 070722  005037  002424               CLR     SUCCESS
2590 070726  012703  000200               MOV     #200,R3
2591 070732  012701  000060               MOV     #'0,R1
2592 070736                               BEGIN WHODUNIT
     070736                                                          B202:;;;;;;
2593 070736                               FOR R4 := #0 TO #16 BY #2
     070736  005004                                                            CLR R4
     070740                                                          B203:;;;;;;
2594 070740                                 IFB R3 SET.IN MKCSRS
     070740  130337  002334                                                    BITB R3,MKCSRS
     070744  001452                                                            BEQ L1027
2595 070746  016437  002214  002260          MOV CSRFB(R4),FIRSTB
2596 070754  016437  002234  002262          MOV CSRLB(R4),LASTB
2597 070762  010437  002000                 MOV R4,BADCSR
2598 070766  006337  002000                 ASL BADCSR
2599 070772                                 IF FIRSTB LE BANK AND LASTB GE BANK
     070772  023737  002260  002106                                            CMP FIRSTB,BANK
     071000  003034                                                            BGT L1030
     071002  023737  002262  002106                                            CMP LASTB,BANK
     071010  002430                                                            BLT L1030
2600 071012  016402  002174                   MOV       CSR2(R4),R2
2601 071016  072227  177764                   ASH       #-12.,R2
2602 071022  042702  177770                   BIC       #^C7,R2
2603 071026                                   CASE R2
     071026  010246                                                            MOV R2,-(SP)
     071030  006316                                                            ASL @SP
     071032  004737  071056                                                    JSR PC,L1031
2604 071036  071152                             ADD..0
2605 071040  071162                             ADD..1
2606 071042  071202                             ADD..2
2607 071044  071232                             ADD..3
2608 071046  071262                             ADD..4
2609 071050  071264                             ADD..5
2610 071052  071304                             ADD..6
2611 071054  071334                             ADD..7
2612 071056                                   END ;OF CASE R2
     071056                                                          L1031:;;;;;;
     071056  062616                                                            ADD (SP)+,@SP
     071060  013646                                                            MOV @(SP)+,-(SP)
```

```
                                                    IF SUCCESS IS TRUE THEN LEAVE WHODUNIT

                                                      END ;OF IF FIRSTB

                                                    END ;OF IFB R3

                                                    ROR   R3
                                                    INC   R1
                                                  END ;OF FOR CSRNO

                                                  END WHODUNIT

                                                  IF SUCCESS IS TRUE

                                                    MOVB  R1,MSG057+1
                                                  END ;OF IF SUCCESS

                                                  TYPE    MSG057
                                                  TYPEIT  ,MSG057
                                                  .DSABL  CRF
                                                  MOVB    #'?,MSG057+1
                                                  POP     R4,R3,R2,R1,CSRNO

                                                  RETURN
```

```
                JSR PC,@(SP)+

                TST SUCCESS
                BNE E202

L1030:;;;;;;

L1027:;;;;;;



                ADD #2,R4
                CMP R4,#16
                BLE B203
E203:;;;;;;;

E202:;;;;;;

                TST SUCCESS
                BEQ L1032

L1032:;;;;;;



                MOV (SP)+,R4
                MOV (SP)+,R3
                MOV (SP)+,R2
                MOV (SP)+,R1
                MOV (SP)+,CSRNO
```

```
 2629 071152                            ADD..0: SET     SUCCESS
      071152  012737  177777  002424                                                    MOV  #-1,SUCCESS
 2630 071160  000207                            RETURN
 2631 071162                            ADD..1: IF #BIT2 OFF.IN ADDRESS THEN LET SUCCESS := ONES
      071162  032737  000004  002040                                                    BIT #BIT2,ADDRESS
      071170  001003                                                                    BNE L1033
      071172  013737  002726  002424                                                    MOV ONES,SUCCESS
      071200                                                                  L1033:;;;;;;
 2632 071200  000207                            RETURN
 2633 071202                            ADD..2: IF #BIT3 OFF.IN ADDRESS AND #BIT2 OFF.IN ADDRESS THEN LET SUCCESS := ONES
      071202  032737  000010  002040                                                    BIT #BIT3,ADDRESS
      071210  001007                                                                    BNE L1034
      071212  032737  000004  002040                                                    BIT #BIT2,ADDRESS
      071220  001003                                                                    BNE L1034
      071222  013737  002726  002424                                                    MOV ONES,SUCCESS
      071230                                                                  L1034:;;;;;;
 2634 071230  000207                            RETURN
 2635 071232                            ADD..3: IF #BIT3 SET.IN ADDRESS AND #BIT2 OFF.IN ADDRESS THEN LET SUCCESS := ONES
      071232  032737  000010  002040                                                    BIT #BIT3,ADDRESS
      071240  001407                                                                    BEQ L1035
      071242  032737  000004  002040                                                    BIT #BIT2,ADDRESS
      071250  001003                                                                    BNE L1035
      071252  013737  002726  002424                                                    MOV ONES,SUCCESS
      071260                                                                  L1035:;;;;;;
 2636 071260  000207                            RETURN
 2637 071262  000207                    ADD..4: RETURN
 2638 071264                            ADD..5: IF #BIT2 SET.IN ADDRESS THEN LET SUCCESS := ONES
      071264  032737  000004  002040                                                    BIT #BIT2,ADDRESS
      071272  001403                                                                    BEQ L1036
      071274  013737  002726  002424                                                    MOV ONES,SUCCESS
      071302                                                                  L1036:;;;;;;
 2639 071302  000207                            RETURN
 2640 071304                            ADD..6: IF #BIT3 OFF.IN ADDRESS AND #BIT2 SET.IN ADDRESS THEN LET SUCCESS := ONES
      071304  032737  000010  002040                                                    BIT #BIT3,ADDRESS
      071312  001007                                                                    BNE L1037
      071314  032737  000004  002040                                                    BIT #BIT2,ADDRESS
      071322  001403                                                                    BEQ L1037
      071324  013737  002726  002424                                                    MOV ONES,SUCCESS
      071332                                                                  L1037:;;;;;;
 2641 071332  000207                            RETURN
 2642 071334                            ADD..7: IF #BIT3 SET.IN ADDRESS AND #BIT2 SET.IN ADDRESS THEN LET SUCCESS := ONES
      071334  032737  000010  002040                                                    BIT #BIT3,ADDRESS
      071342  001407                                                                    BEQ L1040
      071344  032737  000004  002040                                                    BIT #BIT2,ADDRESS
      071352  001403                                                                    BEQ L1040
      071354  013737  002726  002424                                                    MOV ONES,SUCCESS
      071362                                                                  L1040:;;;;;;
 2643 071362  000207                            RETURN
 2644
 2645 071364                            DETAIL: SUBTST  <<SUBR  DETAILED ERROR REPORT>>
                                        ;*****************************************************************************
                                        ;*SUBTEST       SUBR    DETAILED ERROR REPORT
                                        ;*****************************************************************************
 2646 071364  005237  002326                    INC     DETFLAG
 2647 071370  022737  000003  002326            CMP     #3,DETFLAG
 2648 071376  101465                            BLOS    4$
 2649 071400  022737  000002  002326            CMP     #2,DETFLAG
```

```
2650 071406  001435                          BEQ     2$
2651 071410                                  PUSH    HEADER,MUT
     071410  013746  002724                                      MOV HEADER,-(SP)
     071414  013746  002116                                      MOV MUT,-(SP)
2652 071420                                  SET     HEADER
     071420  012737  177777  002724                              MOV  #-1,HEADER
2653 071426  005037  002116                  CLR     MUT
2654 071432  010037  002306                  MOV     R0,DETR0
2655 071436  012700  002310                  MOV     #DETR1,R0
2656 071442  010120                          MOV     R1,(R0)+
2657 071444  010220                          MOV     R2,(R0)+
2658 071446  010320                          MOV     R3,(R0)+
2659 071450  010420                          MOV     R4,(R0)+
2660 071452  010520                          MOV     R5,(R0)+
2661 071454  013720  002030                  MOV     ERRSP,(R0)+
2662 071460  013720  002034                  MOV     ERRPSW,(R0)+
2663 071464  013700  002306                  MOV     DETR0,R0
2664 071470                                  SET     NOERROR
     071470  012737  177777  002530                              MOV  #-1,NOERROR
2665 071476  104013                          ERROR   +13
2666 071500  000415                          BR      1$
2667 071502                          2$:     PUSH    HEADER,MUT
     071502  013746  002724                                      MOV HEADER,-(SP)
     071506  013746  002116                                      MOV MUT,-(SP)
2668 071512                                  SET     HEADER
     071512  012737  177777  002724                              MOV  #-1,HEADER
2669 071520  005037  002116                  CLR     MUT
2670 071524                                  SET     NOERROR
     071524  012737  177777  002530                              MOV  #-1,NOERROR
2671 071532  104031                          ERROR   +31
2672 071534                          1$:     POP     MUT,HEADER
     071534  012637  002116                                      MOV (SP)+,MUT
     071540  012637  002724                                      MOV (SP)+,HEADER
2673                                         ;WARNING RECURSIVE
2674 071544  004737  071364                  CALL    DETAIL
2675 071550  000207                          RETURN
```

```
2678
2679 071552  004737  073404          4$:     ;SIMULATE CONTROL 'T'
                                              CALL    CONTT                   ;DISPLAY 'DISPLAY'' INFO
2680
2681
2682 071556                                   ;TYPE CONTENTS OF ALL CSR'S
                                              PUSH    CSR,CSR+2,CSRNO,R1
     071556  013746  002144                                                          MOV CSR,-(SP)
     071562  013746  002146                                                          MOV CSR+2,-(SP)
     071566  013746  002256                                                          MOV CSRNO,-(SP)
     071572  010146                                                                  MOV R1,-(SP)
2683 071574                                   TYPE    MSG058
     071574  104401  114722                  TYPEIT  ,MSG058
                                              .DSABL  CRF
2684 071600                                   TYPE    $CRLF
     071600  104401  003010                  TYPEIT  ,$CRLF
                                              .DSABL  CRF
2685 071604  013701  002334                  MOV     MKCSRS,R1
2686 071610                                   BEGIN DUMPCSRLOOP
     071610                                                                     B204:::::::
2687 071610                                     FOR CSRNO :  #0 TO #34 BY #4
     071610  005037  002256                                                          CLR CSRNO
     071614                                                                     B205:::::::
2688 071614  106301                             ASLB        R1
2689 071616                                     ON.ERROR
     071616  103013                                                                  BCC L1041
2690 071620  104426                               READCSR
2691 071622                                       TYPOCT    CSR
     071622  013746  002144                  MOV     CSR,-(SP)       ;;SAVE CSR FOR TYPEOUT
     071626  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                              .DSABL  CRF
2692 071630                                       TYPE      MSG018          ;2 SPACES
     071630  104401  112161                  TYPEIT  ,MSG018
                                              .DSABL  CRF
2693 071634                                       TYPOCT    CSR+2
     071634  013746  002146                  MOV     CSR+2,-(SP)     ;;SAVE CSR+2 FOR TYPEOUT
     071640  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                              .DSABL  CRF
2694 071642                                       TYPE      MSG018          ;2 SPACES
     071642  104401  112161                  TYPEIT  ,MSG018
                                              .DSABL  CRF
2695 071646                                     END ;OF ON.ERROR
     071646                                                                     L1041:::::::
2696 071646                                     IFB R1 EQ #0 THEN LEAVE DUMPCSRLOOP
     071646  105701                                                                 TSTB R1
     071650  001407                                                                 BEQ E204
2697 071652                                   END ;OF FOR CSRNO
     071652  062737  000004  002256                                                 ADD #4,CSRNO
     071660  023727  002256  000034                                                 CMP CSRNO,#34
     071666  003752                                                                 BLE B205
     071670                                                                     E205:::::::
2698 071670                                   END DUMPCSRLOOP
     071670                                                                     E204:::::::
2699 071670                                   POP     R1,CSRNO,CSR+2,CSR
     071670  012601                                                                 MOV (SP)+,R1
     071672  012637  002256                                                        MOV (SP)+,CSRNO
     071676  012637  002146                                                        MOV (SP)+,CSR+2
     071702  012637  002144                                                        MOV (SP)+,CSR
```

```
 2702                                   ;TYPE STACKS
 2703 071706                            PUSH    R0,R1
      071706  010046                                                    MOV R0,-(SP)
      071710  010146                                                    MOV R1,-(SP)
 2704
 2705                                   ;TYPE KERNEL STACK
 2706 071712                            TYPE    MSG088          ;KERNEL STACK
      071712  104401  115760           TYPEIT  ,MSG088
                                       .DSABL  CRF
 2707 071716  013701  002706           MOV     KSTACK,R1
 2708 071722  162701  000002           SUB     #2,R1
 2709 071726                            FOR     R0 :  SP TO R1 BY #2
      071726  010600                                                    MOV SP,R0
      071730                                                          B206:;;;;;;
 2710 071730                              TYPE  $CRLF
      071730  104401  003010           TYPEIT  ,$CRLF
                                       .DSABL  CRF
 2711 071734                              TYPOCT        R0
      071734  010046                   MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
      071736  104402                   TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                       .DSABL  CRF
 2712 071740                              TYPE          MSG018          ;2 SPACES
      071740  104401  112161           TYPEIT  ,MSG018
                                       .DSABL  CRF
 2713 071744                              TYPOCT        (R0)
      071744  011046                   MOV     (R0),-(SP)      ;;SAVE (R0) FOR TYPEOUT
      071746  104402                   TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                       .DSABL  CRF
 2714 071750                            END ;OF FOR R0
      071750  062700  000002                                                    ADD #2,R0
      071754  020001                                                            CMP R0,R1
      071756  003764                                                            BLE B206
      071760                                                                E206:;;;;;;;
 2715
 2716
 2717 071760  042737  030000  177776   BIC     #BIT13!BIT12,PSW        ;SET PREVIOUS MODE TO SUPERVISOR
 2718 071766  052737  010000  177776   BIS     #BIT12,PSW
 2719 071774  006506                   MFPI    SSP
 2720 071776                            POP     R0
      071776  012600                                                            MOV (SP)+,R0
 2721 072000                            TYPE    MSG089          ;SUPERVISOR STACK
      072000  104401  115776           TYPEIT  ,MSG089
                                       .DSABL  CRF
 2722 072004                            IF R0 LT #SUPSTK
      072004  020027  000740                                                    CMP R0,#SUPSTK
      072010  002016                                                            BGE L1042
 2723 072012                              FOR R0 := R0 TO #SUPSTK-2 BY #2
      072012                                                                B207:;;;;;;;
 2724 072012                                TYPE        $CRLF
      072012  104401  003010           TYPEIT  ,$CRLF
                                       .DSABL  CRF
 2725 072016                                TYPOCT      R0
      072016  010046                   MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
      072020  104402                   TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                       .DSABL  CRF
 2726 072022                                TYPE        MSG018          ;2 SPACES
      072022  104401  112161           TYPEIT  ,MSG018
```

```
                                        .DSABL  CRF
 2727 072026                              TYPOCT      (R0)
      072026  011046                    MOV     (R0),-(SP)      ;;SAVE (R0) FOR TYPEOUT
      072030  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                        .DSABL  CRF
 2728 072032                              END ;OF FOR R0
      072032  062700  000002                                                    ADD #2,R0
      072036  020027  000736                                                    CMP R0,#SUPSTK-2
      072042  003763                                                            BLE B207
      072044                                                            E207:::::::
 2729 072044                            ELSE
      072044  000402                                                           BR L1043
      072046                                                            L1042:::::::
 2730 072046                              TYPE  MSG091          ;IS EMPTY
      072046  104401  116034            TYPEIT  ,MSG091
                                        .DSABL  CRF
 2731 072052                            END ;OF IF R0
      072052                                                            L1043:::::.
 2732
 2733                                   ;TYPE USER STACK
 2734 072052  052737  030000  177776    BIS     #BIT13.BIT12,PSW        ;SET PREVIOUS MODE TO USER
 2735 072060  006506                    MFPI    USP
 2736 072062                            POP     R0
      072062  012600                                                            MOV (SP)+,R0
 2737 072064                            TYPE    MSG090          ;USER STACK
      072064  104401  116020            TYPEIT  ,MSG090
                                        .DSABL  CRF
 2738 072070                            IF R0 LT #USESTK
      072070  020027  000700                                                    CMP R0,#USESTK
      072074  002016                                                            BGE L1044
 2739 072076                              FOR R0 : R0 TO #USESTK-2 BY #2
      072076                                                            B210:::::::
 2740 072076                              TYPE          $CRLF
      072076  104401  003010            TYPEIT  ,$CRLF
                                        .DSABL  CRF
 2741 072102                              TYPOCT      R0
      072102  010046                    MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
      072104  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                        .DSABL  CRF
 2742 072106                              TYPE          MSG018          ;2 SPACES
      072106  104401  112161            TYPEIT  ,MSG018
                                        .DSABL  CRF
 2743 072112                              TYPOCT      (R0)
      072112  011046                    MOV     (R0),-(SP)      ;;SAVE (R0) FOR TYPEOUT
      072114  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                        .DSABL  CRF
 2744 072116                              END ;OF FOR R0
      072116  062700  000002                                                    ADD #2,R0
      072122  020027  000676                                                    CMP R0,#USESTK-2
      072126  003763                                                            BLE B210
      072130                                                            E210:::::::
 2745 072130                            ELSE
      072130  000402                                                           BR L1045
      072132                                                            L1044:::::::
 2746 072132                              TYPE  MSG091          ;IS EMPTY
      072132  104401  116034            TYPEIT  ,MSG091
                                        .DSABL  CRF
```

```
 2747 072136                                    END ;OF IF R0
      072136
 2748 072136                                    TYPE    $CRLF
      072136  104401  003010                    TYPEIT  ,$CRLF
                                                .DSABL  CRF
 2749 072142  005037  002326                    CLR     DETFLAG
 2750 072146                                    POP     R1,R0
      072146  012601                                                MOV (SP)+,R1
      072150  012600                                                MOV (SP)+,R0
 2751 072152  000207                            RETURN
```

```
2754 072154                            QUE:    SUBTST  <<QUE MESSAGES FROM SLAVE CPU'S>>
                                       ;*****************************************************************
                                       ;*SUBTEST       QUE MESSAGES FROM SLAVE CPU'S
                                       ;*****************************************************************
2755 072154  104410                            CKSWR
2756 072156                            PUSH    R0,R1,CONTRL
     072156  010046                                                                    MOV R0,-(SP)
     072160  010146                                                                    MOV R1,-(SP)
     072162  013746  177746                                                            MOV CONTRL,-(SP)
2757 072166  104424                    CACHOFF                 ;TURN CACHE OFF
2758 072170                            FOR R0 := #2 TO #6 BY #2
     072170  012700  000002                                                            MOV #2,R0
     072174                                                                  B211:;;;;;;
2759 072174                              IF PTYFLAG(R0) IS TRUE
     072174  005760  002626                                                            TST PTYFLAG(R0)
     072200  001446                                                                    BEQ L1046
2760 072202  010001                        MOV     R0,R1
2761 072204  006201                        ASR     R1
2762 072206  062701  000060                ADD     #'0,R1
2763 072212  110137  116242                MOVB    R1,MSGA98
2764 072216                                TYPE    MSG098          ;SLAVEN>        ;WHERE N = 1,2, OR 3
     072216  104401  116234            TYPEIT  ,MSG098
                                        .DSABL  CRF
2765 072222                            QUE1:       IFB PTYBUF(R0) NE #32       ;CONTROL Z?
     072222  126027  002636  000032                                                  CMPB PTYBUF(R0),#32
     072230  001415                                                                  BEQ L1047
2766 072232                                  PUSH      PTYBUF(R0)
     072232  016046  002636                                                        MOV PTYBUF(R0),-(SP)
2767 072236  005060  002626                  CLR       PTYFLAG(R0)
2768 072242  004737  057076                  CALL      $TYPEC
2769 072246  062706  000002                  ADD       #2,SP             ;FIX STACK
2770 072252  005760  002626          1$:     TST       PTYFLAG(R0)
2771 072256  100375                          BPL       1$
2772 072260                                  GOTO      QUE1
     072260  000760                                                                  BR QUE1
2773 072262                                ELSE
     072262  000415                                                                  BR L1050
     072264                                                                  L1047:;;;;;;
2774 072264                                  TYPE      MSG099            ;MASTER>
     072264  104401  116245            TYPEIT  ,MSG099
                                        .DSABL  CRF
2775 072270  005060  002626                  CLR       PTYFLAG(R0)
2776 072274                                  IF RLFLAG IS TRUE
     072274  005737  002134                                                          TST RLFLAG
     072300  001406                                                                  BEQ L1051
2777 072302                                    SET     SLAVERROR
     072302  012737  177777  002570                                                  MOV  #-1,SLAVERROR
2778 072310  104000                            ERROR                   ;LOG ERROR
2779 072312  005037  002570                    CLR     SLAVERROR
2780 072316                                  END ;OF IF RLFLAG IS TRUE
     072316                                                                  L1051:;;;;;;
2781 072316                                END ;OF IF PTYBUF(R0)
     072316                                                                  L1050:;;;;;;
2782 072316                              END ;OF IF PTYFLAG(R0)
     072316                                                                  L1046:;;;;;;
2783 072316                            END ;OF FOR R0
     072316  062700  000002                                                          ADD #2,R0
```

```
072322  020027  000006                                                  CMP R0,#6
072326  003722                                                          BLE B211
072330                                                          E211:::::::::
;784 072330                     POP     CONTRL,R1,R0
072330  012637  177746                                                  MOV (SP)+,CONTRL
072334  012601                                                          MOV (SP)+,R1
072336  012600                                                          MOV (SP)+,R0
;785 072340  162737  000001  002574     SUB     #1,HUNGTIME            ;CARRY IS ERROR FLAG ON RETURN
;786 072346  000207                     RETURN
```

```
2789                                            .SBTTL  ROUTINE BINARY TO OCTAL (ASCII) AND TYPE
2790
2791                                    ;*********************************************************************
2792                                    ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
2793                                    ;*OCTAL (ASCII) NUMBER AND TYPE IT.
2794                                    ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
2795                                    ;*CALL:
2796                                    ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
2797                                    ;*      TYPOS                   ;;CALL FOR TYPEOUT
2798                                    ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
2799                                    ;*      .BYTE   M               ;;M=1 OR 0
2800                                    ;*                                      ;;1-TYPE LEADING ZEROS
2801                                    ;*                                      ;;0-SUPPRESS LEADING ZEROS
2802                                    ;*
2803                                    ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
2804                                    ;*$TYPOS OR $TYPOC
2805                                    ;*CALL:
2806                                    ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
2807                                    ;*      TYPON                   ;;CALL FOR TYPEOUT
2808                                    ;*
2809                                    ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
2810                                    ;*CALL:
2811                                    ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
2812                                    ;*      TYPOC                   ;;CALL FOR TYPEOUT
2813
2814 072350  017646  000000         $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
2815 072354  116637  000001 072573         MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
2816 072362  112637  072575                 MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
2817 072366  062716  000002                 ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
2818 072372  000406                         BR      $TYPON
2819 072374  112737  000001 072573 $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
2820 072402  112737  000006 072575         MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
2821 072410  112737  000005 072572 $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
2822 072416  010346                         MOV     R3,-(SP)        ;;SAVE R3
2823 072420  010446                         MOV     R4,-(SP)        ;;SAVE R4
2824 072422  010546                         MOV     R5,-(SP)        ;;SAVE R5
2825 072424  113704  072575                 MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
2826 072430  005404                         NEG     R4
2827 072432  062704  000006                 ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
2828 072436  110437  072574                 MOVB    R4,$OMODE       ;;SAVE IT FOR USE
2829 072442  113704  072573                 MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
2830 072446  016605  000012                 MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
2831 072452  005003                         CLR     R3              ;;CLEAR THE OUTPUT WORD
2832 072454  006105                 1$:     ROL     R5              ;;ROTATE MSB INTO "C"
2833 072456  000404                         BR      3$              ;;GO DO MSB
2834 072460  006105                 2$:     ROL     R5              ;;FORM THIS DIGIT
2835 072462  006105                         ROL     R5
2836 072464  006105                         ROL     R5
2837 072466  010503                         MOV     R5,R3
2838 072470  006103                 3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
2839 072472  105337  072574                 DECB    $OMODE          ;;TYPE THIS DIGIT?
2840 072476  100016                         BPL     6$              ;;BR IF NO
2841 072500  042703  177770                 BIC     #177770,R3      ;;GET RID OF JUNK
2842 072504  001002                         BNE     4$              ;;TEST FOR 0
2843 072506  005704                         TST     R4              ;;SUPPRESS THIS 0?
2844 072510  001403                         BEQ     5$              ;;BR IF YES
2845 072512  005204                 4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
```

```
2846 072514  052703  000060            BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
2847 072520  052703  000040      5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
2848 072524  110337  072570            MOVB    R3,8$           ;;SAVE FOR TYPING
2849 072530                            TYPE    8$              ;;GO TYPE THIS DIGIT
     072530  104401  072570            TYPEIT  ,8$
                                       .DSABL  CRF
2850 072534  105337  072572      6$:   DECB    $OCNT           ;;COUNT BY 1
2851 072540  003347                    BGT     2$              ;;BR IF MORE TO DO
2852 072542  002402                    BLT     7$              ;;BR IF DONE
2853 072544  005204                    INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
2854 072546  000744                    BR      2$              ;;GO DO THE LAST DIGIT
2855 072550  012605            7$:     MOV     (SP)+,R5        ;;RESTORE R5
2856 072552  012604                    MOV     (SP)+,R4        ;;RESTORE R4
2857 072554  012603                    MOV     (SP)+,R3        ;;RESTORE R3
2858 072556  016666  000002  000004    MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
2859 072564  012616                    MOV     (SP)+,(SP)
2860 072566  000002                    RTI                     ;;RETURN
2861 072570     000            8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
2862 072571     000                    .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
2863 072572     000            $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
2864 072573     000            $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
2865 072574  000000            $OMODF: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
                                .SBTTL  ROUTINE CONVERT BINARY TO DECIMAL AND TYPE
                        ;*****************************************************************************
                        ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                        ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                        ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                        ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                        ;*REPLACED WITH SPACES.
                        ;*CALL:
                        ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                        ;*      TYPDS                   ;;GO TO THE ROUTINE
072576                  $TYPDS: PUSH    R0,R1,R2,R3,R5
072576  010046                                                                    MOV R0,-(SP)
072600  010146                                                                    MOV R1,-(SP)
072602  010246                                                                    MOV R2,-(SP)
072604  010346                                                                    MOV R3,-(SP)
072606  010546                                                                    MOV R5,-(SP)
072610  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
072614  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
072620  100004                          BPL     1$              ;;BR IF INPUT IS POS.
072622  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
072624  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
072632  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
072634  012703  073012                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
072640  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
072644  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
072646  016001  073002                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
072652  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
072654  002402                          BLT     4$              ;;BR IF DONE
072656  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
072660  000774                          BR      3$
072662  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
072664  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
072666  001002                          BNE     5$              ;;FALL THROUGH IF 0
072670  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
072672  100407                          BMI     7$              ;;BR IF YES
072674  106316                  5$:     ASLB    (SP)            ;;MSD?
072676  103003                          BCC     6$              ;;BR IF NO
072700  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
072706  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
072712  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
072716  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
072720  005720                          TST     (R0)+           ;;JUST INCREMENTING
072722  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
072726  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
072730  003002                          BGT     8$              ;;GO TO EXIT
072732  010502                          MOV     R5,R2           ;;GET THE LSD
072734  000764                          BR      6$              ;;GO CHANGE TO ASCII
072736  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
072740  100003                          BPL     9$              ;;BR IF NO
072742  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
072750  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
072752                          POP     R5,R3,R2,R1,R0
072752  012605                                                                    MOV (SP)+,R5
072754  012603                                                                    MOV (SP)+,R3
072756  012602                                                                    MOV (SP)+,R2
072760  012601                                                                    MOV (SP)+,R1
072762  012600                                                                    MOV (SP)+,R0
```

```
2914 072764                                        TYPE    $DBLK           ;;NOW TYPE THE NUMBER
     072764  104401  073012                        TYPEIT  .$DBLK
                                                    .DSABL  CRF
2915 072770  016666  000002  000004                MOV     2(SP),4(SP)     ;;ADJUST THE STACK
2916 072776  012616                                MOV     (SP)+,(SP)
2917 073000  000002                                RTI                     ;;RETURN TO USER
2918 073002  023420                        $DTBL:  10000.
2919 073004  001750                                1000.
2920 073006  000144                                100.
2921 073010  000012                                10.
2922 073012  000000  000000  000000  $DBLK:  .WORD   0,0,0,0
     073020  000000
```

```
                                        .SBTTL  ROUTINE TTY INPUT
                                ;*******************************************************************************
                                ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                ;*WHEN OPERATING IN TTY FLAG MODE.
                                        .ENABLE LSB
073022                          $CKSWR: IF CPUBIT NE #MASTER            ;SLAVES DON'T GET KEYBOARDS!
073022  023727  002114  000020                                                    CMP CPUBIT,#MASTER
073030  001401                                                                    BEQ L1052
073032  000002                          RTI
                                        END ;OF IF CPUBIT
073034                                                                  L1052:::::::
073034  105777  107732                  TSTB    @$TKS           ;;CHAR THERE?
073040  100125                          BPL     12$             ;;IF NO, DON'T WAIT AROUND
073042  117746  107726                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
073046  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
073052  022716  000006          CONTS1: CMP     #6,(SP)         ;IS IT CONTROL F?
073056  001002                          BNE     1$              ;NO SKIP
073060  004737  043774                  CALL    FIELDSERVICE
073064  022716  000024          1$:     CMP     #24,(SP)        ;IS IT CONTROL T?
073070  001002                          BNE     16$             ;NO - SKIP
073072  004737  073404                  CALL    CONTT           ;YES - CALL CONTROL T ROUTINE
073076  022716  000003          16$:    CMP     #3,(SP)         ;IS IT CONTROL C?
073102  001451                          BEQ     5$              ;YES EXIT *****NOTE***** STACK IS SCREWED UP.
073104  022716  000004                  CMP     #4,(SP)         ;IS IT CONTROL D?
073110  001002                          BNE     2$              ;NO - SKIP
073112  000137  075774          CONTP:  JMP     @#0.ODT         ;YES - GO TO ODT
073116  022716  000023          2$:     CMP     #23,(SP)        ;IS IT CONTROL S?
073122  001002                          BNE     6$              ;NO - SKIP
073124  004737  073544                  CALL    CONTS           ;YES - CALL CONTROL S ROUTINE
073130  022737  000176  002766  6$:     CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
073136  001067                          BNE     CKEND           ;;BRANCH IF NO
073140  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
073144  001064                          BNE     CKEND           ;;NO, RETURN TO USER
073146  005737  002066                  TST     $AUTO           ;ARE WE RUNNING IN AUTO-MODE?
073152  001061                          BNE     CKEND           ;BRANCH IF YES
073154                                  TYPE    $CNTLG          ;;ECHO THE CONTROL-G (^G)
073154  104401  074236                  TYPEIT  ,$CNTLG
                                        .DSABL  CRF
073160                          $GTSWR: TYPE    $MSWR           ;;TYPE CURRENT CONTENTS
073160  104401  074243                  TYPEIT  ,$MSWR
                                        .DSABL  CRF
073164                                  TYPOCT  @SWR            ;;OF THE SWR
073164  017746  107576                  MOV     @SWR,-(SP)      ;;SAVE @SWR FOR TYPEOUT
073170  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
                                        .DSABL  CRF
073172                                  TYPE    $MNEW           ;;PROMPT FOR NEW SWR
073172  104401  074254                  TYPEIT  ,$MNEW
                                        .DSABL  CRF
073176  005046                  3$:     CLR     -(SP)           ;;CLEAR COUNTER
073200  005046                          CLR     -(SP)           ;;THE NEW SWR
073202  105777  107564          4$:     TSTB    @$TKS           ;;CHAR THERE?
073206  100375                          BPL     4$              ;;IF NOT TRY AGAIN
073210  117746  107560                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
073214  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
073220  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
```

```
2969 073224  001006                        BNE     7$              ;;BRANCH IF NOT
2970 073226                          5$:   TYPE    $CNTLC          ;;YES, ECHO CONTROL-C (^C)
     073226  104401  074224                TYPEIT  ,$CNTLC
                                          .DSABL  CRF
2971 073232  062706  000006                ADD     #6,SP           ;;CLEAN UP STACK
2972 073236  000137  043416                JMP     BOOT            ;;CONTROL-C RESTART
2973 073242  021627  000025          7$:   CMP     (SP),#25        ;;IS IT A CONTROL-U?
2974 073246  001005                        BNE     9$              ;;BRANCH IF NOT
2975 073250                                TYPE    $CNTLU          ;;YES, ECHO CONTROL-U (^U)
     073250  104401  074231                TYPEIT  ,$CNTLU
                                          .DSABL  CRF
2976 073254  062706  000006          8$:   ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
2977 073260  000746                        BR      3$              ;;LET'S TRY IT AGAIN
2978 073262  021627  000015          9$:   CMP     (SP),#15        ;;IS IT A <CR>?
2979 073266  001016                        BNE     13$             ;;BRANCH IF NO
2980 073270  005766  000004                TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
2981 073274  001403                        BEQ     10$             ;;BRANCH IF YES
2982 073276  016677  000002  107462        MOV     2(SP),@SWR      ;;SAVE NEW SWR
2983 073304  062706  000006          10$:  ADD     #6,SP           ;;CLEAR UP STACK
2984 073310                                TYPE    $CRLF           ;;ECHO <CR> AND <LF>
     073310  104401  003010                TYPEIT  ,$CRLF
                                          .DSABL  CRF
2985 073314  000002                  12$:  RTI                     ;;RETURN
2986 073316  062706  000002          CKEND: ADD    #2,SP           ;FIX STACK
2987 073322  000002                        RTI                     ;RETURN
2988 073324  004737  057076          13$:  CALL    $TYPEC          ;;ECHO CHAR
2989 073330  021627  000060                CMP     (SP),#60        ;;CHAR < 0?
2990 073334  002420                        BLT     15$             ;;BRANCH IF YES
2991 073336  021627  000067                CMP     (SP),#67        ;;CHAR > 7?
2992 073342  003015                        BGT     15$             ;;BRANCH IF YES
2993 073344  042726  000060                BIC     #60,(SP)+       ;;STRIP-OFF ASCII
2994 073350  005766  000002                TST     2(SP)           ;;IS THIS THE FIRST CHAR
2995 073354  001403                        BEQ     14$             ;;BRANCH IF YES
2996 073356  006316                        ASL     (SP)            ;;NO, SHIFT PRESENT
2997 073360  006316                        ASL     (SP)            ;;    CHAR OVER TO MAKE
2998 073362  006316                        ASL     (SP)            ;;    ROOM FOR NEW ONE.
2999 073364  005266  000002          14$:  INC     2(SP)           ;;KEEP COUNT OF CHAR
3000 073370  056616  177776                BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
3001 073374  000702                        BR      4$              ;;GET THE NEXT ONE
3002 073376                          15$:  TYPE    $QUES           ;;TYPE ?<CR><LF>
     073376  104401  003007                TYPEIT  ,$QUES
                                          .DSABL  CRF
3003 073402  000724                        BR      8$              ;;SIMULATE CONTROL-U
3004                                      .DSABL  LSB
```

```
3007 073404                            CONTT:  SUBTST  <<CONTROL T>>
                                       ;*************************************************************************
                                       ;*SUBTEST       CONTROL T
                                       ;*************************************************************************
3008 073404                                    PUSH    R0
     073404  010046                                                                          MOV R0,-(SP)
3009 073406                                    TYPE    $CRLF
     073406  104401  003010                    TYPEIT  ,$CRLF
                                               .DSABL  CRF
3010 073412                                    IF MDISPLAY LT #0 AND MDISPLAY GT #-256.
     073412  005737  002676                                                                 TST MDISPLAY
     073416  002015                                                                         BGE L1053
     073420  023727  002676  177400                                                         CMP MDISPLAY,#-256.
     073426  003411                                                                        BLE L1053
3011                                             ;WE ARE IN MULTIPROCESSOR MODE
3012 073430  013700  002676                      MOV   MDISPLAY,R0
3013 073434  005400                              NEG   R0
3014 073436                                      TYPE  MSG100                  ;MULTIPROCESSOR TEST #
     073436  104401  116256                    TYPEIT  ,MSG100
                                               .DSABL  CRF
3015 073442                                      TYPOCS        R0,,3           ;TYPE 3 DIGITS
     073442  010046                            MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
     073444  104403                            TYPOS                   ;;GO TYPE--OCTAL ASCII
     073446     003                            .BYTE   3               ;;TYPE 3 DIGIT(S)
     073447     000                            .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                               .DSABL  CRF
3016 073450                                    ELSE
     073450  000433                                                                         BR L1054
     073452                                                                          L1053:;;;;;;
3017 073452                                      IF RLFLAG IS TRUE
     073452  005737  002134                                                                 TST RLFLAG
     073456  001402                                                                         BEQ L1055
3018 073460                                        TYPE        MSG092          ;RELOCATED
     073460  104401  116046                    TYPEIT  ,MSG092
                                               .DSABL  CRF
3019 073464                                      END ;OF IF RLFLAG
     073464                                                                          L1055:;;;;;;
3020 073464                                      TYPE  MSG093                  ;BANK=
     073464  104401  116062                    TYPEIT  ,MSG093
                                               .DSABL  CRF
3021 073470                                      TYPOCS        BANK,,3         ;TYPE 3 DIGITS
     073470  013746  002106                    MOV     BANK,-(SP)      ;;SAVE BANK FOR TYPEOUT
     073474  104403                            TYPOS                   ;;GO TYPE--OCTAL ASCII
     073476     003                            .BYTE   3               ;;TYPE 3 DIGIT(S)
     073477     000                            .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                               .DSABL  CRF
3022 073500                                      TYPE  MSG094                  ;MAR-
     073500  104401  116070                    TYPEIT  ,MSG094
                                               .DSABL  CRF
3023 073504  013700  177750                      MOV   MAINT,R0
3024 073510  006200                              ASR   R0
3025 073512  042700  177770                      BIC   #^C7,R0
3026 073516                                      TYPOCS        R0,,1           ;TYPE 1 DIGIT
     073516  010046                            MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
     073520  104403                            TYPOS                   ;;GO TYPE--OCTAL ASCII
     073522     001                            .BYTE   1               ;;TYPE 1 DIGIT(S)
     073523     000                            .BYTE   0               ;;SUPPRESS LEADING ZEROS
```

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                                        .DSABL  CRF
                                          TYPE  MSG095                    ;PAT-
3027 073524
     073524  104401  116077             TYPEIT  ,MSG095
                                        .DSABL  CRF
                                          TYPOCS        REALPAT,,2        ;TYPE 2 DIGITS
3028 073530
     073530  013746  002366             MOV     REALPAT,-(SP)   ;;SAVE REALPAT FOR TYPEOUT
     073534  104403                     TYPOS                   ;;GO TYPE--OCTAL ASCII
     073536     002                     .BYTE   2               ;;TYPE 2 DIGIT(S)
     073537     000                     .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                        .DSABL  CRF
3029 073540                             END ;OF IF @DISPLAY
     073540                                                             L1054:;;;;;;
3030 073540                             POP     R0
     073540  012600                                                             MOV (SP)+,R0
3031 073542  000207                     RETURN
3032
3033 073544                     CONTS:  SUBTST  <<CONTROL S & CONTROL Q>>
                                ;*****************************************************************************
                                ;*SUBTEST        CONTROL S & CONTROL Q
                                ;*****************************************************************************
3034 073544                             POP     R0              ;GET RID OF RETURN ADDRESS FROM STACK
     073544  012600                                                             MOV (SP)+,R0
3035 073546  105777  107220     CONTS2: TSTB    @$TKS           ;WAIT FOR CHARACTER
3036 073552  100375                     BPL     CONTS2
3037 073554  117716  107214             MOVB    @$TKB,(SP)      ;REPLACE OVER OLD CHARACTER ON STACK
3038 073560  042716  177600             BIC     #^C177,(SP)     ;STRIP ALL BUT ASCII
3039 073564                             IF (SP) EQ #21          ;IF IT IS A CONTROL Q
     073564  021627  000021                                                     CMP (SP),#21
     073570  001003                                                             BNE L1056
3040 073572  000137  073052               JMP   CONTS1
3041 073576                             ELSE
     073576  000401                                                             BR L1057
     073600                                                             L1056:;;;;;;
3042 073600  000762                       BR    CONTS2
3043 073602                             END ;OF IF (SP)
     073602                                                             L1057:;;;;;;
```

```
3045                                    ;*****************************************************************************
3046                                    ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
3047                                    ;*CALL:
3048                                    ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
3049                                    ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
3050                                    ;*                              ;;WITH PARITY BIT STRIPPED OFF
3051                                    ;
3052
3053 073602  011646                    $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
3054 073604  016666  000004  000002            MOV     4(SP),2(SP)     ;;SAVE THE PS
3055 073612  105777  107154            1$:     TSTB    @$TKS           ;;WAIT FOR
3056 073616  100375                            BPL     1$              ;;A CHARACTER
3057 073620  117766  107150  000004            MOVB    @$TKB,4(SP)     ;;READ THE TTY
3058 073626  042766  177600  000004            BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
3059 073634  026627  000004  000023            CMP     4(SP),#23       ;;IS IT A CONTROL-S?
3060 073642  001013                            BNE     3$              ;;BRANCH IF NO
3061 073644  105777  107122            2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
3062 073650  100375                            BPL     2$              ;;LOOP UNTIL ITS THERE
3063 073652  117746  107116                    MOVB    @$TKB,-(SP)     ;;GET CHARACTER
3064 073656  042716  177600                    BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
3065 073662  022627  000021                    CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
3066 073666  001366                            BNE     2$              ;;IF NOT DISCARD IT
3067 073670  000750                            BR      1$              ;;YES, RESUME
3068 073672  026627  000004  000140    3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
3069 073700  002407                            BLT     4$              ;;BRANCH IF YES
3070 073702  026627  000004  000175            CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
3071 073710  003003                            BGT     4$              ;;BRANCH IF YES
3072 073712  042766  000040  000004            BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
3073 073720  000002                    4$:     RTI                     ;;GO BACK TO USER
3074                                    ;*****************************************************************************
3075                                    ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
3076                                    ;*CALL:
3077                                    ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
3078                                    ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
3079                                    ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
3080 073722  010346                    $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
3081 073724  005046                            CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
3082 073726  012703  074200            1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
3083 073732  022703  074224            2$:     CMP     #$TTYIN+20.,R3  ;;BUFFER FULL?
3084 073736  101467                            BLOS    8$              ;;BR IF YES
3085 073740  104411                            RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
3086 073742  112613                            MOVB    (SP)+,(R3)      ;;GET CHARACTER
3087 073744  122713  000003                    CMPB    #3,(R3)         ;;IS IT A CONTROL-C?
3088 073750  001006                            BNE     3$              ;;BRANCH IF NO
3089 073752                                    TYPE    $CNTLC          ;;TYPE A CONTROL-C (^C)
     073752  104401  074224                    TYPEIT  ,$CNTLC
                                                .DSABL  CRF
3090 073756  005726                            TST     (SP)+           ;;CLEAN RUBOUT KEY OFF OF THE STACK
3091 073760  012603                            MOV     (SP)+,R3        ;;RESTORE R3
3092 073762  000137  043416                    JMP     BOOT            ;;GOTO CONTROL-C RESTART
3093 073766  122713  000177            3$:     CMPB    #177,(R3)       ;;IS IT A RUBOUT
3094 073772  001022                            BNE     5$              ;;BR IF NO
3095 073774  005716                            TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
3096 073776  001007                            BNE     4$              ;;BR IF NO
3097 074000  112737  000134  074176            MOVB    #'\,10$         ;;TYPE A BACK SLASH
3098 074006                                    TYPE    10$
     074006  104401  074176                    TYPEIT  ,10$
```

```
                                                .DSABL  CRF
3099 074012  012716  177777                     MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
3100 074016  005303                 4$:         DEC     R3              ;;BACKUP BY ONE
3101 074020  020327  074200                     CMP     R3,#$TTYIN      ;;STACK EMPTY?
3102 074024  103434                             BLO     8$              ;;BR IF YES
3103 074026  111337  074176                     MOVB    (R3),10$                ;;SETUP TO TYPEOUT THE DELETED CHAR.
3104 074032                                     TYPE    10$             ;;GO TYPE
     074032  104401  074176                     TYPEIT  ,10$
                                                .DSABL  CRF
3105 074036  000735                             BR      2$              ;;GO READ ANOTHER CHAR.
3106 074040  005716                 5$:         TST     (SP)            ;;RUBOUT KEY SET?
3107 074042  001406                             BEQ     6$              ;;BR IF NO
3108 074044  112737  000134  074176             MOVB    #'\,10$         ;;TYPE A BACK SLASH
3109 074052                                     TYPE    10$
     074052  104401  074176                     TYPEIT  ,10$
                                                .DSABL  CRF
3110 074056  005016                             CLR     (SP)            ;;CLEAR THE RUBOUT KEY
3111 074060  122713  000025                 6$: CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
3112 074064  001003                             BNE     7$              ;;BR IF NO
3113 074066                                     TYPE    $CNTLU          ;;TYPE A CONTROL 'U'
     074066  104401  074231                     TYPEIT  ,$CNTLU
                                                .DSABL  CRF
3114 074072  000715                             BR      1$              ;;GO START OVER
3115 074074  122713  000022                 7$: CMPB    #22,(R3)        ;;IS CHARACTER A '^R'?
3116 074100  001011                             BNE     9$              ;;BRANCH IF NO
3117 074102  105013                             CLRB    (R3)            ;;CLEAR THE CHARACTER
3118 074104                                     TYPE    $CRLF           ;;TYPE A 'CR' & 'LF'
     074104  104401  003010                     TYPEIT  ,$CRLF
                                                .DSABL  CRF
3119 074110                                     TYPE    $TTYIN          ;;TYPE THE INPUT STRING
     074110  104401  074200                     TYPEIT  ,$TTYIN
                                                .DSABL  CRF
3120 074114  000706                             BR      2$              ;;GO PICKUP ANOTHER CHACTER
3121 074116                                 8$: TYPE    $QUES           ;;TYPE A '?'
     074116  104401  003007                     TYPEIT  ,$QUES
                                                .DSABL  CRF
3122 074122  000701                             BR      1$              ;;CLEAR THE BUFFER AND LOOP
3123 074124  111337  074176                 9$: MOVB    (R3),10$                ;;ECHO THE CHARACTER
3124 074130                                     TYPE    10$
     074130  104401  074176                     TYPEIT  ,10$
                                                .DSABL  CRF
3125 074134  122723  000015                     CMPB    #15,(R3)+       ;;CHECK FOR RETURN
3126 074140  001274                             BNE     2$              ;;LOOP IF NOT RETURN
3127 074142  105063  177777                     CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
3128 074146                                     TYPE    $LF             ;;TYPE A LINE FEED
     074146  104401  003011                     TYPEIT  ,$LF
                                                .DSABL  CRF
3129 074152  005726                             TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
3130 074154  012603                             MOV     (SP)+,R3        ;;RESTORE R3
3131 074156  011646                             MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
3132 074160  016666  000004  000002             MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
3133 074166  012766  074200  000004             MOV     #$TTYIN,4(SP)
3134 074174  000002                             RTI                     ;;RETURN
3135 074176     000                 10$:        .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
3136 074177     000                             .BYTE   0               ;;TERMINATOR
3137 074200  000024                 $TTYIN:     .REPT   20.             ;;RESERVE SIZE BYTES FOR TTY INPUT
3140 074224     136     103     015 $CNTLC:     .ASCIZ  /^C/<15><12>    ;;CONTROL 'C'
```

```
                074227  012     000
3141            074231  136     125     015     $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U'
                074234  012     000
3142            074236  136     107     015     $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL 'G'
                074241  012     000
3143            074243  015     012     123     $MSWR:  .ASCIZ  <15><12>/SWR    /
                074246  127     122     040
                074251  075     040     000
3144            074254  040     040     116     $MNEW:  .ASCIZ  /   NEW    /
                074257  105     127     040
                074262  075     040     000
3145                                            .EVEN
```

```
                                        .SBTTL  ROUTINE READ AN OCTAL NUMBER FROM THE TTY
                                ;*****************************************************************************
                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;*CHANGE IT TO BINARY.
                                ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A '?' WILL BE TYPED
                                ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
074266  011646                  $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
074270  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
074276                                  PUSH    R0,R1,R2
074276  010046                                                                  MOV R0,-(SP)
074300  010146                                                                  MOV R1,-(SP)
074302  010246                                                                  MOV R2,-(SP)
074304  104412                  1$:     RD IN                   ;;READ AN ASCIZ LINE
074306  012600                          MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
074310  010037  074414                  MOV     R0,5$           ;;AND SAVE IT
074314  005001                          CLR     R1              ;;CLEAR DATA WORD
074316  005002                          CLR     R2
074320  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
074322  001420                          BEQ     3$              ;;IF ZERO GET OUT
074324  122716  000060                  CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
074330  003026                          BGT     4$              ;;IS AN OCTAL DIGIT
074332  122716  000067                  CMPB    #'7,(SP)
074336  002423                          BLT     4$
074340  006301                          ASL     R1              ;;*2
074342  006102                          ROL     R2
074344  006301                          ASL     R1              ;;*4
074346  006102                          ROL     R2
074350  006301                          ASL     R1              ;;*8
074352  006102                          ROL     R2
074354  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
074360  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
074362  000756                          BR      2$              ;;LOOP
074364  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
074366  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
074372  010237  074434                  MOV     R2,$HIOCT
074376                                  POP     R2,R1,R0
074376  012602                                                                  MOV (SP)+,R2
074400  012601                                                                  MOV (SP)+,R1
074402  012600                                                                  MOV (SP)+,R0
074404  000002                          RTI                     ;;RETURN
074406  005726                  4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
074410  105010                          CLRB    (R0)            ;;SET A TERMINATOR
074412                                  TYPE                    ;;TYPE UP THRU THE BAD CHAR.
074412  104401                          TYPEIT
                                        .DSABL  CRF
074414  000000                  5$:     .WORD   0
074416                                  TYPE    MSG062          ;INPUT MUST BE A
074416  104401  115067                  TYPEIT  ,MSG062
                                        .DSABL  CRF
074422                                  TYPE    MSG063          ;N OCTAL
074422  104401  115107                  TYPEIT  ,MSG063
```

```
                                        .DSABL  CRF
3193 074426                             TYPE    MSG064          ;NUMBER
     074426  104401  115120              TYPEIT  ,MSG064
                                        .DSABL  CRF
3194 074432  000724                     BR      1$              ;;TRY AGAIN
3195 074434  000000             $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
3196                                    .SBTTL  ROUTINE READ A DECIMAL NUMBER FROM THE TTY
3197
3198                            ;*****************************************************************************
3199                            ;*THIS ROUTINE WILL READ A DECIMAL (ASCII) NUMBER FROM THE TTY AND
3200                            ;*CHANGE IT TO BINARY. IF TOO MANY CHARACTERS OR ANY ILLEGAL CHARACTERS
3201                            ;*ARE READ A "?" FOLLOWED BY A CARRIAGE RETURN-LINE FEED WILL BE TYPED.
3202                            ;*THE COMPLETE NUMBER MUST BE RETYPED. THE INPUT IS TERMINATED BY THE
3203                            ;*USER TYPING A CARRIAGE RETURN. THE RANGE OF THE INPUT NUMBER IS
3204                            ;*POSITIVE 32767 TO NEGATIVE 32768.
3205                            ;*CALL:
3206                            ;*      RDDEC                   ;;READ A DECIMAL NUMBER
3207                            ;*      RETURN HERE             ;;NUMBER IS ON TOP OF THE STACK
3208                            ;
3209
3210 074436  011646             $RDDEC: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR
3211 074440  016666  000004  000002     MOV     4(SP),2(SP)     ;;THE INPUT NUMBER
3212 074446                             PUSH    R0,R1,R2
     074446  010046                                                          MOV R0,-(SP)
     074450  010146                                                          MOV R1,-(SP)
     074452  010246                                                          MOV R2,-(SP)
3213 074454  104412             1$:     RDLIN                   ;;READ AN ASCIZ LINE
3214 074456  012600                     MOV     (SP)+,R0        ;;ADDRESS OF 1ST CHAR.
3215 074460  010037  074604             MOV     R0,6$           ;;SAVE INCASE OF BAD INPUT
3216 074464  005046                     CLR     -(SP)           ;;CLEAR DATA WORD
3217 074466  005002                     CLR     R2              ;;SIGN SET POSITIVE
3218 074470  122710  000055             CMPB    #'-,(R0)        ;;SEE IF A MINUS SIGN WAS TYPED
3219 074474  001001                     BNE     2$              ;;BR IF NO MINUS SIGN
3220 074476  112002                     MOVB    (R0)+,R2        ;;SAVE FOR LATER USE
3221 074500  112001             2$:     MOVB    (R0)+,R1        ;;PICKUP THIS CHARACTER
3222 074502  001424                     BEQ     3$              ;;GET OUT IF ZERO
3223 074504  122701  000060             CMPB    #'0,R1          ;;MAKE SURE THIS CHARACTER
3224 074510  003032                     BGT     5$              ;;IS A DIGIT BETWEEN 0 & 9
3225 074512  122701  000071             CMPB    #'9,R1
3226 074516  002427                     BLT     5$
3227 074520  032716  170000             BIT     #^C7777,(SP)    ;;DON'T LET NUMBER GET TO BIG
3228 074524  001024                     BNE     5$              ;;BR IF NUMBER WOULD OVERFLOW
3229 074526  006316                     ASL     (SP)            ;;*2
3230 074530  011646                     MOV     (SP),-(SP)      ;;SAVE FOR LATER
3231 074532  006316                     ASL     (SP)            ;;*4
3232 074534  006316                     ASL     (SP)            ;;*8.
3233 074536  062616                     ADD     (SP)+,(SP)      ;;*10.
3234 074540  102416                     BVS     5$              ;;OVERFLOW ISN'T ALLOWED
3235 074542  162701  000060             SUB     #'0,R1          ;;STRIP AWAY THE ASCII JUNK
3236 074546  060116                     ADD     R1,(SP)         ;;ADD IN THIS DIGIT
3237 074550  102412                     BVS     5$              ;;OVERFLOW ISN'T ALLOWED
3238 074552  000752                     BR      2$              ;;LOOP
3239 074554  005702             3$:     TST     R2              ;;CHECK IF NUMBER IS NEG
3240 074556  001401                     BEQ     4$              ;;BR IF NO
3241 074560  005416                     NEG     (SP)            ;;YES--NEGATE THE NUMBER
3242 074562  012666  000010     4$:     MOV     (SP)+,12(SP)    ;;SAVE THE RESULT
3243 074566                             POP     R2,R1,R0
```

```
                074566  012602                                          MOV     (SP)+,R2
                074570  012601                                          MOV     (SP)+,R1
                074572  012600                                          MOV     (SP)+,R0
     3244       074574  000002                  RTI                     ;;RETURN
     3245
     3246       074576  005726          5$:     TST     (SP)+           ;;CLEAN PARTIAL NUMBER FROM STACK
     3247       074600  105010                  CLRB    (R0)            ;;SET A TERMINATOR
     3248       074602                          TYPE                    ;;TYPE THE INPUT UP TO BAD CHAR.
                074602  104401                  TYPEIT
                                                .DSABL  CRF
     3249       074604  000000          4$:     .WORD   0               ;;POINTER GOES HERE
     3250       074606                          TYPE    MSG062          ;INPUT MUSST BE A
                074606  104401  115067          TYPEIT  ,MSG062
                                                .DSABL  CRF
     3251       074612                          TYPE    MSG065          ;DECIMAL
                074612  104401  115130          TYPEIT  ,MSG065
                                                .DSABL  CRF
     3252       074616                          TYPE    MSG064          ;NUMBER
                074616  104401  115120          TYPEIT  ,MSG064
                                                .DSABL  CRF
     3253       074622  000714                  BR      1$              ;;TRY AGAIN
```

```
                                .SBTTL  ROUTINE SAVE AND RESTORE R0-R5

                        ;*****************************************************************
                        ;*SAVE R0-R5
                        ;*CALL:
                        ;*      SAVREG
                        ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                        ;*
                        ;*TOP---(+16)
                        ;* +2---(+18)
                        ;* +4---R5
                        ;* +6---R4
                        ;* +8---R3
                        ;*+10---R2
                        ;*+12---R1
                        ;*+14---R0

074624                  $SAVREG:
074624                          PUSH    R0,R1,R2,R3,R4,R5
074624  010046                                                          MOV R0,-(SP)
074626  010146                                                          MOV R1,-(SP)
074630  010246                                                          MOV R2,-(SP)
074632  010346                                                          MOV R3,-(SP)
074634  010446                                                          MOV R4,-(SP)
074636  010546                                                          MOV R5,-(SP)
074640  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
074644  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
074650  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
074654  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
074660  000002                          RTI

                        ;*RESTORE R0-R5
                        ;*CALL:
                        ;*      RESREG
074662                  $RESREG:
074662  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
074666  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
074672  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
074676  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
074702                          POP     R5,R4,R3,R2,R1,R0
074702  012605                                                          MOV (SP)+,R5
074704  012604                                                          MOV (SP)+,R4
074706  012603                                                          MOV (SP)+,R3
074710  012602                                                          MOV (SP)+,R2
074712  012601                                                          MOV (SP)+,R1
074714  012600                                                          MOV (SP)+,R0
074716  000002                          RTI
```

```
3291                                    .SBTTL  ROUTINE RANDOM NUMBER GENERATOR
3292
3293                            ;*******************************************************************************
3294                            ;*THIS ROUTINE IS A DOUBLE PRECISION PSEUDO RANDOM NUMBER GENERATOR
3295                            ;*WITH A RANGE OF 0 TO 2**(+33)-1.
3296                            ;*CALL:
3297                            ;*      CALL    $RAND           ;;CALL THE ROUTINE
3298                            ;*      RETURN                  ;;RETURN HERE THE RANDOM
3299                            ;*                              ;;NUMBER WILL BE IN
3300                            ;*                              ;;$HINUM,$LONUM
3301
3302 074720                     $RAND:  PUSH    R0,R1,R2
        074720  010046                                                          MOV R0,-(SP)
        074722  010146                                                          MOV R1,-(SP)
        074724  010246                                                          MOV R2,-(SP)
3303 074726  013700  002716                    MOV     SEEDLO,R0       ;SET R0 WITH LOW
3304 074732  013701  002714                    MOV     SEEDHI,R1       ;SET R1 WITH HIGH
3305 074736  012702  000007                    MOV     #7,R2           ;SET SHIFT COUNT
3306 074742  006300                    1$:     ASL     R0              ;;SHIFT R0 LEFT AND
3307 074744  006101                            ROL     R1              ;;ROTATE CARRY INTO R1 AND
3308 074746  077203                            SOB     R2,1$
3309 074750  063700  002716                    ADD     SEEDLO,R0       ;ADD NUMBER TO MAKE X 129
3310 074754  005501                            ADC     R1              ;;PROPOGATE CARRY
3311 074756  063701  002714                    ADD     SEEDHI,R1       ;ADD NUMBER TO MAKE X 129
3312 074762  062700  001057                    ADD     #1057,R0        ;;ADD LOW CONSTANT
3313 074766  005501                            ADC     R1              ;;PROPOGATE CARRY
3314 074770  062701  047401                    ADD     #47401,R1       ;;ADD HIGH CONSTANT
3315 074774  010037  002716                    MOV     R0,SEEDLO       ;SAVE R0
3316 075000  010137  002714                    MOV     R1,SEEDHI       ;SAVE R1
3317 075004                                    POP     R2,R1,R0
        075004  012602                                                          MOV (SP)+,R2
        075006  012601                                                          MOV (SP)+,R1
        075010  012600                                                          MOV (SP)+,R0
3318 075012  000207                            RETURN
```

```
3321                                            .SBTTL  ROUTINE DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT
3322                                    ;*******************************************************************************
3323                                    ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
3324                                    ;*UNSIGNED OCTAL ASCIZ NUMBER.
3325                                    ;*CALL
3326                                    ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
3327                                    ;*      CALL    $DB20           ;;CALL THE ROUTINE
3328                                    ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK
3329
3330
3331 075014  104415                    $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
3332 075016  016601  000002                    MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
3333 075022  012705  075133                    MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
3334 075026  012704  000014                    MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
3335 075032  012703  177770                    MOV     #^C7,R3         ;;MASK
3336 075036  012100                    1$:     MOV     (R1)+,R0        ;;LOWER WORD
3337 075040  012101                            MOV     (R1)+,R1        ;;HIGH WORD
3338 075042  005002                            CLR     R2              ;;TERMINATOR
3339 075044  110245                            MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
3340 075046  010002                            MOV     R0,R2           ;;GET THIS DIGIT
3341 075050  005304                            DEC     R4              ;;COUNT THIS CHARACTER
3342 075052  003007                            BGT     3$              ;;BR IF NOT THE LAST DIGIT
3343 075054  001405                            BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
3344 075056  005205                            INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
3345 075060  010566  000002                    MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
3346 075064  104416                            RESREG                  ;;RESTORE ALL REGISTERS
3347 075066  000207                            RETURN                  ;;RETURN TO USER
3348 075070  006203                    2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
3349 075072  006001                    3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
3350 075074  006000                            ROR     R0              ;;      THE NEXT OCTAL DIGIT
3351 075076  006001                            ROR     R1
3352 075100  006000                            ROR     R0
3353 075102  006001                            ROR     R1
3354 075104  006000                            ROR     R0
3355 075106  040302                            BIC     R3,R2           ;;MASK OUT ALL JUNK
3356 075110  062702  000060                    ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
3357 075114  000753                            BR      1$              ;;GO PUT IT IN THE DATA TABLE
3358 075116  000016                    $OCTVL: .REPT   14.             ;;RESERVE DATA TABLE
3361         075122                    $OCT8-$OCTVL+4                  ;POINTER TO 11 DIGIT NUMBER
```

```
                                        .SBTTL  TABLES

                                        .SBTTL  APT MAILBOX-ETABLE
075154                          $MAIL:
075134  000000                  $MSGTY: .WORD   0       ;;MESSAGE TYPE CODE
075136  000000                  $FATAL: .WORD   0       ;;FATAL ERROR NUMBER (ERROR PC)
075140  000000                  $TESTN: .WORD   0       ;;TEST NUMBER (DISPLAY REGISTER)
075142  000000                  $PASS:  .WORD   0       ;;PASS COUNT
075144  000000                  $DEVCT: .WORD   0       ;;DEVICE COUNT
075146  000000                  $UNIT:  .WORD   0       ;;I/O UNIT NUMBER
075150  000000                  $MSGAD: .WORD   0       ;;MESSAGE ADDRESS
075152  000000                  $MSGLG: .WORD   0       ;;MESSAGE LENGTH
075154                          $ETABLE:                ;;APT ENVIRONMENT TABLE
075154      000                 $ENV:   .BYTE   0       ;;ENVIRONMENT BYTE      ;SET TO A 1 FOR APT AUTO MODE
075155      000                 $ENVM:  .BYTE   0       ;ENVIRONMENT MODE
                                                        ;BIT7(200)=USE APT SIZE INFO ;BIT5(40)=NO CONSOLE
075156  000001                  $SWREG: .WORD   1       ;;APT SWITCH REGISTER
075160  000000                  $USWR:  .WORD   0       ;USED TO LIMIT THE NUMBER OF PASSES
075162  030400                  $CPUOP: .WORD   30400   ;;CPU TYPE,OPTIONS
                                                        BITS 15-11=CPU TYPE
                                                                11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                                                                11/70=06,PDQ=07,Q=10
                                                        BIT 10=REAL TIME CLOCK
                                                        BIT  9=FLOATING POINT PROCESSOR
                                                        BIT  8=MEMORY MANAGEMENT
075164      001                 $MAMS1: .BYTE   1       ;;HIGH ADDRESS,M.S. BYTE ;DEFAULT   64K
075165      004                 $MTYP1: .BYTE   4       ;;MEM. TYPE,BLK#1
                                                        MEM.TYPE BYTE   --  (HIGH BYTE)
                                                                900 NSEC CORE=001
                                                                300 NSEC BIPOLAR-002
                                                                500 NSEC MOS=003
                                                                MK11 ERROR CORRECTING MOS=004
075166  177776                  $MADR1: .WORD   177776  ;;HIGH ADDRESS,BLK#1
                                                          MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF ''TYPE'' ABOVE
075170      000                 $MAMS2: .BYTE   0       ;;HIGH ADDRESS,M.S. BYTE
075171      000                 $MTYP2: .BYTE   0       ;;MEM.TYPE,BLK#2
075172  000000                  $MADR2: .WORD   0       ;;MEM.LAST ADDRESS,BLK#2
075174      000                 $MAMS3: .BYTE   0       ;;HIGH ADDRESS,M.S.BYTE
075175      000                 $MTYP3: .BYTE   0       ;;MEM.TYPE,BLK#3
075176  000000                  $MADR3: .WORD   0       ;;MEM.LAST ADDRESS,BLK#3
075200      000                 $MAMS4: .BYTE   0       ;;HIGH ADDRESS,M.S.BYTE
075201      000                 $MTYP4: .BYTE   0       ;;MEM.TYPE,BLK#4
075202  000000                  $MADR4: .WORD   0       ;;MEM.LAST ADDRESS,BLK#4
075204  000000                  $VECT1: .WORD   0       ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
075206  000000                  $VECT2: .WORD   0       ;;INTERRUPT VECTOR#2BUS PRIORITY#2
075210  000000                  $BASE:  .WORD   0       ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
075212  000000                  $DEVM:  .WORD   0       ;;DEVICE MAP

                                ;IF EITHOR OF THESE 2 WORDS ARE NON ZERO
                                ;THEY WILL BE LOADED INTO ALL CSR'S & THE PROGRAM WILL STOP
075214  000000                  $CDW1:  .WORD   0       ;CSR
075216  000000                  $CDW2:  .WORD   0       ;CSR+2

                                ;THE FOLLOWING LOCATIONS SPECIFY WHICH PATTERNS
                                ;ARE TO BE RUN FOR PARTICULAR MEMORIES
                                ;
                                ;REFERENCE THE TABLE LISTED BELOW TO RELATE BITS TO PATTERNS.
```

```
                                        ;BIT0 SET WILL RUN THE FIRST ENTRY IN THE TABLE, BIT0 SET
                                        ;IN THE SECOND WORD WILL RUN THE 17TH ENTRY IN THE TABLE ...
                                        ;
                                        ;NOTE** NULL TESTS DO NOT TAKE ANY TIME
                                        ;
075220  177777                          $DDW0:  .WORD   177777  ;MK11 CSR TESTS         TABLE - MKCSRT:
075222  177777                          $DDW1:  .WORD   177777  ;MK11 CSR TESTS         TABLE = MKCSRT:
075224  102777                          $DDW2:  .WORD   102777  ;MK11 PATTERNS          TABLE = MKPAT:
075226  177777                          $DDW3:  .WORD   177777  ;MK11 PATTERNS          TABLE = MKPAT:
075230  103777                          $DDW4:  .WORD   103777  ;MJ11 PATTERNS          TABLE = MJPAT:
075232  177777                          $DDW5:  .WORD   177777  ;MJ11 PATTERNS          TABLE = MJPAT:
075234  000001                          $DDW6:  .WORD   1       ;NUMBER OF CPU'S
075236                                  $ETEND:
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.
                                        ;
075236                                  $APTHD:
075236  000000                          $HIBTS: .WORD   0               ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
075240  075134                          $MBADR: .WORD   $MAIL           ;;ADDRESS OF APT MAILBOX (BITS 0-15)
075242  000010                          $TSTM:  .WORD   8.              ;;RUN TIM OF LONGEST TEST
075244  000144                          $PASTM: .WORD   100.            ;;RUN TIME IN SECS. OF 1ST PASS ON 128K (QUICK VERIFY)
075246  000310                          $UNITM: .WORD   200.            ;;ADDITIONAL RUN TIME OF A PASS FOR EACH ADDITIONAL 128K
075250  000041                                  .WORD   $ETEND-$MAIL/2  ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
3444                                    .SBTTL  ROUTINE TRAP DECODER
3445
3446                                ;*****************************************************************************
3447                                ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
3448                                ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
3449                                ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
3450                                ;*GO TO THAT ROUTINE.
3451
3452 075252  010046                $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
3453 075254  016600  000002                MOV     2(SP),R0        ;;GET TRAP ADDRESS
3454 075260  005740                        TST     -(R0)           ;;BACKUP BY 2
3455 075262  111000                        MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
3456 075264  006300                        ASL     R0              ;;POSITION FOR INDEXING
3457 075266  016000  075314                MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
3458 075272  000200                        RTS     R0              ;;GO TO ROUTINE
3459
3460
3461                                ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
3462
3463 075274  011646                $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
3464 075276  016666  000004  000002        MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
3465 075304  000002                        RTI                     ;;RESTORE THE PSW
3466
3467 075306                        $NOTRAP:TYPE    MSG006          ;UNDEFINED TRAP INSTRUCTION
     075306  104401  111640                TYPEIT  ,MSG006
                                            .DSABL  CRF
3468 075312  000000                $HALT2: HALT
```

```
                                        .SBTTL  TRAP TABLE

                                ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                ;*BY THE "TRAP" INSTRUCTION.

                                ;       ROUTINE
                                ;       -------
075314  075274                  $TRPAD: .WORD   $TRAP2
075316  056752                          $TYPE   ;CALL=TYPEIT    TRAP+1(104401)  TTY TYPEOUT ROUTINE
075320  072374                          $TYPOC  ;CALL=TYPOC     TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
075322  072350                          $TYPOS  ;CALL=TYPOS     TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
075324  075306                          $NOTRAP;$TYPON  ;CALL=TYPON     TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
075326  072576                          $TYPDS  ;CALL=TYPDS     TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
075330  075306                          $NOTRAP;$TYPBN  ;CALL-TYPBN     TRAP+6(104406)  TYPE BINARY (ASCII) NUMBER

075332  073160                          $GTSWR  ;CALL=GTSWR     TRAP+7(104407)  GET SOFT-SWR SETTING
075334  073022                          $CKSWR  ;CALL=CKSWR     TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR

075336  073602                          $RDCHR  ;CALL=RDCHR     TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE
075340  073722                          $RDLIN  ;CALL=RDLIN     TRAP+12(104412) TTY TYPEIN STRING ROUTINE
075342  074266                          $RDOCT  ;CALL=RDOCT     TRAP+13(104413) READ AN OCTAL NUMBER FROM TTY
075344  074436                          $RDDEC  ;CALL=RDDEC     TRAP+14(104414) READ A DECIMAL NUMBER FROM TTY

075346  074624                          $SAVREG ;CALL=SAVREG    TRAP+15(104415) SAVE R0-R5 ROUTINE
075350  074662                          $RESREG ;CALL=RESREG    TRAP+16(104406) RESTORE R0-R5 ROUTINE

075352  037020                          $KERNEL  ;CALL=KERNEL   TRAP+17(104417) ENTER KERNEL MODE
075354  037030                          $ENERGIZE;CALL=ENERGIZETRAP+20(104420) TURN ON MEMORY MANAGEMENT & TRAPS
075356  037040                          $DEENERGI;CALL=DEENERGITRAP+21(104421) TURN OFF MEMORY MENAGEMENT & TRAPS

075360  041016                          $KMAP    ;CALL=KMAP     TRAP+22(104422) MAP KERNEL 1 TO 1

075362  037050                          $CACHN  ;CALL=CACHON    TRAP+23(104423) TURN CACHE ON
075364  037066                          $CACHF  ;CALL=CACHOFF   TRAP+24(104424) TURN CACHE OFF

075366  037076                          $LOADC  ;CALL-LOADCSR   TRAP+25(104425) LOAD CORRECT CSR
075370  037220                          $READC  ;CALL=READCSR   TRAP+26(104426) READ CORRECT CSR

075372  064574                          $PER01  ;CALL=PERR01    TRAP+27(104427) PROGRAM DETECTED ERROR
075374  064622                          $PER02  ;CALL=PERR02    TRAP+30(104430) PROGRAM DETECTED ERROR
075376  064650                          $PER03  ;CALL=PERR03    TRAP+31(104431) PROGRAM DETECTED ERROR
075400  064700                          $PER04  ;CALL=PERR04    TRAP+32(104432) PROGRAM DETECTED ERROR
075402  064762                          $PER07  ;CALL=PERR07    TRAP+33(104433) PROGRAM DETECTED ERROR
075404  065004                          $PER10  ;CALL=PERR10    TRAP+34(104434) PROGRAM DETECTED ERROR
075406  065034                          $PER11  ;CALL=PERR11    TRAP+35(104435) PROGRAM DETECTED ERROR
075410  065054                          $PER12  ;CALL=PERR12    TRAP+36(104436) PROGRAM DETECTED ERROR
075412  065076                          $PER13  ;CALL=PERR13    TRAP+37(104437) PROGRAM DETECTED ERROR
075414  065116                          $PER14  ;CALL=PERR14    TRAP+40(104440) PROGRAM DETECTED ERROR
075416  065140                          $PER15  ;CALL=PERR15    TRAP+41(104441) PROGRAM DETECTED ERROR
075420  065162                          $PER16  ;CALL=PERR16    TRAP+42(104442) PROGRAM DETECTED ERROR
075422  065202                          $PER17  ;CALL=PERR17    TRAP+43(104443) PROGRAM DETECTED ERROR
075424  065220                          $PER20  ;CALL=PERR20    TRAP+44(104444) PROGRAM DETECTED ERROR
075426  065236                          $PER21  ;CALL=PERR21    TRAP+45(104445) PROGRAM DETECTED ERROR
075430  065256                          $PER22  ;CALL=PERR22    TRAP+46(104446) PROGRAM DETECTED ERROR
075432  065274                          $PER23  ;CALL=PERR23    TRAP+47(104447) PROGRAM DETECTED ERROR
075434  065312                          $PER24  ;CALL=PERR24    TRAP+50(104450) PROGRAM DETECTED ERROR
075436  065370                          $PER25  ;CALL PERR25    TRAP+51(104451) PROGRAM DETECTED ERROR
```

```
3528 075440  065502    $PER26  ;CALL=PERR26     TRAP+52(104452) PROGRAM DETECTED ERROR
3529 075442  065522    $PER27  ;CALL=PERR27     TRAP+53(104453) PROGRAM DETECTED ERROR
3530 075444  054762    $PER30  ;CALL=PERR30     TRAP+54(104454) PROGRAM DETECTED ERROR
3531 075446  065720    $PER31  ;CALL=PERR31     TRAP+55(104455) PROGRAM DETECTED ERROR
3532 075450  066016    $PER32  ;CALL=PERR32     TRAP+56(104456) PROGRAM DETECTED ERROR
3533 075452  066064    $PER33  ;CALL=PERR33     TRAP+57(104457) PROGRAM DETECTED ERROR
3534 075454  066144    $PER34  ;CALL=PERR34     TRAP+60(104460) PROGRAM DETECTED ERROR
3535 075456  066176    $PER35  ;CALL=PERR35     TRAP+61(104461) PROGRAM DETECTED ERROR
3536 075460  075306    $NOTRAP ;CALL=PERR36     TRAP+62(104462) PROGRAM DETECTED ERROR
3537 075462  075306    $NOTRAP ;CALL=PERR37     TRAP+63(104463) PROGRAM DETECTED ERROR
3538 075464  075306    $NOTRAP ;CALL=PERR40     TRAP+64(104464) PROGRAM DETECTED ERROR
3539 075466  075306    $NOTRAP ;CALL=PERR41     TRAP+65(104465) PROGRAM DETECTED ERROR
3540 075470  075306    $NOTRAP ;CALL=PERR42     TRAP+66(104466) PROGRAM DETECTED ERROR
3541 075472  075306    $NOTRAP ;CALL=PERR43     TRAP+67(104467) PROGRAM DETECTED ERROR
3542
3543 075474  037466    $ECCDIS ;CALL=ECCDIS     TRAP+70(104470) DISABLE ECC ON ALL CSR'S
3544 075476  037522    $ECC1DIS;CALL=ECC1DIS    TRAP+71(104471) DISABLE ECC ON 1 SELECTED CSR
3545 075500  037554    $ECCINIT;CALL=ECCINIT    TRAP+72(104472) INITIALIZE ALL MK11 CSR'S
3546 075502  037574    $ECC1INIT;CALL=ECC1INIT  TRAP+73(104473) INITIALIZE 1 SELECTED MK11 CSR
3547 075504  037700    $CBCSR  ;CALL=CBCSR      TRAP+74(104474) WRITE GENERATED CHECKBITS IN ALL CSR'S
3548 075506  037742    $CB1CSR ;CALL=CB1CSR     TRAP+75(104475) WRITE GENERATED CHECKBITS IN 1 SELECTED CSR
3549 075510  040002    $WASSBE ;CALL=WASSBE     TRAP+76(104476) WAS THERE A SBE ON ANY CSR?
3550 075512  040116    $WAS1SBE;CALL=WAS1SBE    TRAP+77(104477) WAS THERE A SBE ON 1 SELECTED CSR?
3551 075514  040146    $WASDBE ;CALL=WASDBE     TRAP+100(104500)WAS THERE A DBE ON ANY CSR?
3552 075516  040262    $WAS1DBE;CALL=WAS1DBE    TRAP+101(104501)WAS THERE A DBE ON 1 SELECTED CSR?
3553 075520  040322    $CLRCSR ;CALL=CLRCSR     TRAP+102(104502)CLEAR ALL CSR'S
3554 075522  040340    $CLR1CSR;CALL=CLR1CSR    TRAP+103(104503)CLEAR 1 SELECTED CSR
3555 075524  040354    $CHKDIS ;CALL=CHKDIS     TRAP+104(104504)DISABLE ECC & WRITE CKBITS FROM ALL CSR'S
3556 075526  040410    $CHK1DIS;CALL=CHK1DIS    TRAP+105(104505)DISABLE ECC & WRITE CKBITS FROM 1 CSR
3557 075530  037612    $ENASBE ;CALL=ENASBE     TRAP+106(104506)ENABLE TRAPS ON SBE'S FROM ALL CSR'S
3558 075532  037646    $ENA1SBE;CALL=ENA1SBE    TRAP+107(104507)ENABLE TRAPS ON SBE'S FROM 1 SELECTED CSR
3559 075534  037310    $TSTRD  ;CALL=TSTREAD    TRAP+110(104510)TEST LOC (R1) & TST FOR SBE (WITHOUT FETCHES
3560 075536  040510    $INVALID;CALL=INVALID    TRAP+111(104511)INVALIDATE BACKGROUND PATTERN ON BANK
3561 075540  075306    $NOTRAP
3562 075542  075306    $NOTRAP
3563 075544  075306    $NOTRAP
3564 075546  075306    $NOTRAP
3565 075550  075306    $NOTRAP
3566 075552  075306    $NOTRAP
3567 075554  075306    $NOTRAP
3568 075556  075306    $NOTRAP
```

```
3571                                    .SBTTL ODT (CEMKA) DATA AREA
3572    177776          ST              =       177776          ;STATUS REGISTER
3573    000016          O.BKP           =       16              ;NUMBER OF BREAKPOINTS-1 MULT. BY 2
3574    000014          O.TVEC          =       14              ;TRT VECTOR LOCATION
3575    000340          O.STPM          =       340             ;PRIORITY MASK - STATUS REGISTER
3576    000020          O.TBT           =       20              ;T-BIT MASK - STATUS REGISTER
3577    000003          TRT             =       000003          ;TRT INSTRUCTION
3578    177562          O.RDB           =       177562          ;R DATA BUFFER
3579    177560          O.RCSR          =       177560          ;R C/SR
3580    177566          O.TDB           =       177566          ;T DATA BUFFER
3581    177564          O.TCSR          =       177564          ;T C/SR
```

```
                        ;EMXA; DATA AREA                                                    0.*.    .BYTE
3598 075573      000    0.P:     .BYTE   0          ;PROCEED FLAG = -2 IF MANUAL ENTRY
3599                                                ;               -1 IF NO PROCEED ALLOWED
3600                                                ;               0-7 IF PCEED ALLOWED
3601 075574      000    0.CSR1:  .BYTE   0          ;SAVE CELL - R C/SR
3602 075575      000    0.CSR2:  .BYTE   0          ;SAVE CELL - T C/SR
3603 075576   000000    0.FIL:   0                  ;FILL COUNTER
3604 075600      000    0.CMFD:  .BYTE   0          ;COMMA FOUND SWITCH, =0 NO COMMA FOUND
3605                                                ;                    =1 COMMA FOUND
3606 075601      000    0.SMFD:  .BYTE   0          ;SEMICOLON FOUND SWITCH
3607                                                ;=0 NO SEMICOLON FOUND
3608                                                ;=1 SEMICOLON FOUND
3609 075602      000    0.SCRN:  .BYTE   0          ;FLAG; 1=PASS SPACES ON FROM TTY
3610                                                ;ALSO, IF =1, <LF> IS ECHOED
3611 075603      000    0.MINS:  .BYTE   0          ;MINUS SIGN TYPED  (SWITCH)
3612                                                ;0=NO MINUS TYPED;  1=MINUS SIGN TYPED
3613 075604   000000    0.BIAS:  .WORD   0          ;CURRENT RELOCATION BIAS
```

```
3616
3617                    000026          ;THE ORDER OF THE FOLLOWING ENTRIES IS CRITICAL
                                .REPT   26
3620 075662 000000      0.UR0:  0       ;USER R0
3621 075664 000000              0       ;      R1
3622 075666 000000              0       ;      R2
3623 075670 000000              0       ;      R3
3624 075672 000000              0       ;      R4
3625 075674 000000              0       ;      R5
3626 075676 000000      0.USP:  0       ;USER SP
3627 075700 000000      0.UPC:  0       ;USER PC
3628 075702 000000      0.UST:  0       ;USER ST
3629 075704 000007      0.PRI:  7       ;ODT PRIORITY
3630                    ; BREAK POINT LISTS, ADR1 - ADDRESS OF BREAKPOINT,CT = COUNT,
3631                    ;   UIN = CONTENTS
3632
3633 075706                     0.ADR1:
3634            075730                  .=.+0.BKP+4
3635 075730                     0.CT:
3636            075752                  .=.+0.BKP+4
3637 075752                     0.UIN:
3638            075774                  .=.+0.BKP+4
3639 075774                     SLAVEND:;!...!!.....'. ...!.THIS IS THE LIMIT OF SLAVE UNIQUE CODE
```

```
                                ;INITIALIZE ODT
                                ;  USE 0.ODT FOR A NORMAL ENTRY
                                ;  USE 0.ODT+2 TO RESTART ODT - WIPING OUT ALL BREAKPOINTS
                                ;  USE 0.ODT+4 TO RE-ENTER (I.E. - FAKE A BREAKPOINT)
                                
075774  000421                  0.ODT:  BR      2$              ;NORMAL ENTRY
075776  000440                          BR      3$              ;RESTART
076000  004737  101172          1$:     JSR     PC,0.RRST       ;RE-ENTER -- SAVE STATUS
076004  013746  000016                  MOV     0.TVEC+2,-(SP)  ;SET UP LOCAL STATUS
076010  004737  101202                  JSR     PC,0.WST
076014  010746                          MOV     PC,-(SP)        ;FAKE THE PC
076016  012637  075700                  MOV     (SP)+,0.UPC
076022  112737  177777  075573          MOVB    #-1,0.P         ;DISALLOW PROCEED
076030  105037  075571                  CLRB    0.S
076034  000137  100060                  JMP     0.BK1
                                
                                        ;RUN AT CURRENT STATUS
076040  004537  100500          2$:     JSR     5,0.SVTT        ;SAVE TTY STATUS
076044  012737  076000  073114          MOV     #1$,@#CONTP+2
076052  004037  100360                  JSR     0,0.SVR         ;SAVE REGISTERS (MAINLY SP)
076056  012706  075662                  MOV     #0.URO,SP       ;SET UP STACK
076062  012704  101300                  MOV     #0.ID,R4        ;TYPE ID
076066  012703  101315                  MOV     #0.IDND,R3
076072  004537  101126                  JSR     5,0.TYPE
076076  000414                          BR      4$
076100  004037  100360          3$:     JSR     0,0.SVR         ;SAVE REGISTERS
076104  004537  100602                  JSR     5,0.REM         ;REMOVE ALL BREAKPOINTS
076110  113704  075704                  MOVB    0.PRI,R4        ;GET ODT PRIORITY
076114  106004                          RORB    R4              ;SHIFT
076116  106004                          RORB    R4              ; INTO
076120  106004                          RORB    R4              ;  POSITION
076122  010446                          MOV     R4,-(SP)        ;STORE IN STATUS
076124  004737  101202                  JSR     PC,0.WST
076130  105037  075571          4$:     CLRB    0.S             ;DISABLE SINGLE INSTRUCTION FOR NOW
076134  112737  177777  075573          MOVB    #-1,0.P         ;DISALLOW PROCEED
076142  012737  000340  000016          MOV     #0.STM,0.TVEC+2 ;STATUS WORD TO TRT VECTOR+2
076150  012737  100042  000014          MOV     #0.BRK,0.TVEC   ;PC TO TRT VECTOR
076156  000137  077430                  JMP     0.RALL          ;CLEAR BRK PT TABLES
                                ;
                                ;0.CTLC
                                ;       ^C PROCESSING. RETURN TO KEYBOARD MONITOR
                                ;
                                ;
076162  013706  075676          0.CTLC: MOV     0.USP,SP        ;RESTORE USER STACK
076166  012704  076206                  MOV     #1$,R4
076172  012703  076207                  MOV     #2$,R3
076176  004537  101126                  JSR     R5,0.TYPE       ;ECHO "^C"
076202  000137  043416                  JMP     BOOT
076206     136                  1$:     .BYTE '^
076207     103                  2$:     .BYTE 'C
```

```
3694                                    ;CONTROL F PROCESSING
3695 076210  013706  075676             O.CTLF: MOV     O.USP,SP        ;RESTORE USER STACK
3696 076214  012704  076240                     MOV     #1$,R4
3697 076220  012703  076241                     MOV     #2$,R3
3698 076224  004537  101126                     JSR     R5,O.TYPE       ;ECHO ^F
3699 076230  004737  043774                     CALL    FIELDSERVICE
3700 076234  000137  075774                     JMP     O.ODT
3701 076240     136                     1$:     .BYTE   '^
3702 076241     106                     2$:     .BYTE   'F
3703
3704                                    ;CONTROL E PROCESSING
3705 076242  012704  076266             O.CTLE: MOV     #1$,R4
3706 076246  012703  076267                     MOV     #2$,R3
3707 076252  004537  101126                     JSR     R5,O.TYPE       ;ECHO ^E
3708 076256  012705  073116                     MOV     #CONTP+4,R5
3709 076262  000137  077624                     JMP     O.GOGO
3710 076266     136                     1$:     .BYTE   '^
3711 076267     105                     2$:     .BYTE   'E
3712
3713                                    ; SPECIAL NAME HANDLER
3714                                    ;  DEPENDS UPON THE EXPLICIT ORDER OF THE TWO TABLES O.TL AND O.URO
3715
3716 076270  004537  101006             O.REGT: JSR     5,O.GET         ;SPECIAL NAME, GET ONE MORE CHARACTER
3717 076274  012704  101345                     MOV     #O.TL,R4        ;TABLE START ADDRESS
3718 076300  120024                     1$:     CMPB    R0,(R4)+        ;IS THIS THE CORRECT CHARACTER
3719 076302  001414                             BEQ     3$              ;JUMP IF YES
3720 076304  022704  101365                     CMP     #O.TL+O.LG,R4   ;IS THE SEARCH DONE?
3721 076310  101373                             BHI     1$              ;BRANCH IF NOT
3722 076312  042700  177770                     BIC     #177770,R0      ;MASK OFF OCTAL
3723 076316  010004                             MOV     R0,R4
3724 076320  006304                     2$:     ASL     R4
3725 076322  062704  075662                     ADD     #O.URO,R4       ;GENERATE ADDRESS
3726 076326  005202                             INC     R2              ;SET FOUND FLAG
3727 076330  000137  076554                     JMP     O.SCAN          ;GO FIND NEXT CHARACTER
3728 076334  162704  101336             3$:     SUB     #O.TL-7,R4      ;GO FIND NEXT CHARACTER
3729 076340  000767                             BR      2$
```

```
3732                                    ; 'BACKARROW'  HANDLER - OPEN INDEXED ON THE PC (BACK ARROW)
3733                                            .ENABL  LSB
3734 076342  004537  076416            0.ORPC:  JSR     5,2$            ;TEST WORD MODE AND CLOSE
3735 076346  061202                             ADD     @R2,R2          ;COMPUTE
3736 076350  005202                             INC     R2
3737 076352  005202                             INC     R2              ;   NEW ADDRESS
3738 076354  010237  075560            1$:      MOV     R2,0.CAD        ;UPDATE CAD
3739 076360  000137  077226                     JMP     0.OP2A          ;GO FINISH UP
3740 076364  004537  076416            0.ORAB:  JSR     5,2$            ;TEST WORD MODE AND CLOSE
3741 076370  011202                             MOV     @R2,R2          ;GET ABSOLUTE ADDRESS
3742 076372  000770                             BR      1$
3743 076374  004537  076416            0.ORRB:  JSR     5,2$            ;TEST AND CLOSE
3744 076400  011201                             MOV     @R2,R1          ;COMPUTE NEW ADDRESS
3745 076402  110101                             MOVB    R1,R1           ;EXTEND THE SIGN
3746 076404  006301                             ASL     R1              ;R2=2(@R2)
3747 076406  005201                             INC     R1              ;   .+2
3748 076410  005201                             INC     R1
3749 076412  060102                             ADD     R1,R2           ;   +PC
3750 076414  000757                             BR      1$
3751 076416  004737  101214            2$:      JSR     PC,0.CLSE       ;CLOSE CURRENT CELL
3752 076422  022737  000002  075566            CMP     #2,0.BW         ;ONLY WORD MODE ALLOWED
3753 076430  001003                             BNE     3$              ;BRANCH IF ERROR
3754 076432  013702  075560                     MOV     0.CAD,R2        ;CURRENT ADDRESS IN R2
3755 076436  000205                             RTS     R5
3756 076440  005726                    3$:      TST     (SP)+
3757 076442  000137  076510            0.TCL2:  JMP     0.ERR           ;POP A WORD AND SHOW THE ERROR
3758                                            .DSABL  LSB
3759
3760                                    ;       PROCESS S - SINGLE INSTRUCTION MODE
3761 076446  105737  075601            0.SNGL:  TSTB    0.SMFD          ;DONT REACT IF ; NOT TYPED
3762 076452  001773                             BEQ     0.TCL2
3763 076454  005702                             TST     R2              ;SEE IF TURN ON OR TURN OFF
3764 076456  001004                             BNE     1$              ;BRANCH IF TURNING IT ON
3765 076460  105037  075571                     CLRB    0.S             ;CLEAR THE FLAG
3766 076464  000137  076520                     JMP     0.DCD           ;CONTINUE THE SCAN
3767 076470  112737  177777  075571    1$:      MOVB    #-1,0.S         ;SET THE FLAG
3768 076476  000137  076520                     JMP     0.DCD
```

```
3771                                    ;
3772                                    ;MINUS PROCESSING
3773                                    ;
3774 076502  105237  075603            O.MIN:  INCB    O.MINS          ;SET MINUS FOUND SWITCH ON
3775 076506  000420                             BR      O.DCD1
3776
3777                                    ; COMMAND DECODER - ODT11X
3778
3779                                    ;  ALL REGISTERS MAY BE USED (R0-R5).
3780
3781 076510  012700  000077            O.ERR:  MOV     #'?,R0          ;  ? TO BE TYPED
3782 076514  004537  100730                     JSR     5,O.FTYP        ; OUTPUT ?
3783 076520  005037  075566            O.DCD:  CLR     O.BW            ;CLOSE ALL
3784 076524  004537  101254                     JSR     5,O.CRLS        ;TYPE  <CR><LF>*
3785 076530  105037  075601            O.DCD3: CLRB    O.SMFD          ;SEMICOLON FOUND FLAG
3786 076534  105037  075600                     CLRB    O.CMFD          ;COMMA FOUND FLAG
3787 076540  105037  075603                     CLRB    O.MINS          ;MINUS SIGN FOUND FLAG
3788 076544  005003                             CLR     R3              ;R3 IS A SAVE REGISTER FOR R2
3789 076546  005005                             CLR     R5              ;R5 IS A SAVE REGISTER FOR R4
3790 076550  005004            O.DCD1: CLR     R4              ; R4 CONTAINS THE CONVERTED OCTAL
3791 076552  005002                             CLR     R2              ; R2 IS THE NUMBER FOUND FLAG
3792 076554  004537  101006            O.SCAN: JSR     5,O.GET         ;GET A CHAR, RETURN IN R0
3793 076560  022700  000060                     CMP     #'0,R0          ;COMPARE WITH ASCII 0
3794 076564  101013                             BHI     5$              ;CHECK LEGALITY IF NON-NUMERIC
3795 076566  022700  000067                     CMP     #'7,R0          ;COMPARE WITH ASCII 7
3796 076572  103410                             BLO     5$              ;CHECK LEGALITY IF NOT OCTAL
3797 076574  042700  177770                     BIC     #177770,R0      ;CONVERT TO BCD
3798 076600  006304                             ASL     R4              ; MAKE ROOM
3799 076602  006304                             ASL     R4              ;  IN
3800 076604  006304                             ASL     R4              ;    R4
3801 076606  060004                             ADD     R0,R4           ;PACK THREE BITS IN R4
3802 076610  005202                             INC     R2              ;R2 HAS NUMERIC FLAG
3803 076612  000760                             BR      O.SCAN          ;   AND TRY AGAIN
3804 076614  005001            5$:     CLR     R1              ;CLEAR INDEX
3805 076616  120061  101321    1$:     CMPB    R0,O.LGCH(R1)   ;DO THE CODES MATCH?
3806 076622  001405                             BEQ     2$              ;JUMP IF YES
3807 076624  005201                             INC     R1              ; SET INDEX FOR NEXT SEARCH
3808 076626  020127  000024                     CMP     R1,#O.CLGT      ;IS THE SEARCH DONE?
3809 076632  103326                             BHIS    O.ERR           ;    OOPS!
3810 076634  000770                             BR      1$              ;RE-LOOP
3811 076636  105737  075603            2$:     TSTB    O.MINS          ;IF MINUS WAS NOT TYPED
3812 076642  001401                             BEQ     4$              ;DO NOT NEGATE K
3813 076644  005404                             NEG     R4              ;OTHERWISE, TAKE 2'S COMPLEMENT.
3814 076646  105737  075600            4$:     TSTB    O.CMFD          ;IF A COMMA NOT TYPED,
3815 076652  001402                             BEQ     3$              ;SKIP NEXT INSTRUCTION.
3816 076654  063704  075604                     ADD     O.BIAS,R4       ;OTHERWISE, ADD RELOC. BIAS TO (R4)
3817 076660  105037  075603            3$:     CLRB    O.MINS          ;REINITIALIZE MINUS-TYPED SWITCH FOR NXT SCAN
3818 076664  006301                             ASL     R1              ;MULTIPLY BY TWO
3819 076666  000171  076672                     JMP     @6$(R1)         ;GO TO PROPER ROUTINE
```

```
3822 076672 076742                  6$:     C.SEMI  ;  ; SEMICOLON
3823 076674 076760                          O.WRD   ;  /     OPEN WORD
3824 076676 076772                          O.BYT   ;  \     OPEN BYTE -BACK SLASH
3825 076700 077140                          O.CRET  ;  CARRIAGE RETURN     CLOSE
3826 076702 076270                          O.REGT  ;  $  REGISTER OPS
3827 076704 077576                          O.GO    ;  G  GO TO ADDRESS K
3828 076706 077160                          O.OP1   ;  <LF>  MODIFY, CLOSE, OPEN NEXT
3829 076710 076342                          O.ORPC  ;  'BACKARROW''  OPEN RELATED, INDEX - PC (BACK ARROW)
3830 076712 077154                          O.OLD   ;  <  RETURN TO OLD SEQUENCE AND OPEN
3831 076714 077302                          O.BACK  ;  ^  OPEN PREVIOUS (UP ARROW)
3832 076716 077466                          O.OFST  ;  O  OFFSET
3833 076720 077324                          O.BKPT  ;  B  BREAKPOINTS
3834 076722 077732                          O.PROC  ;  P  PROCEED
3835 076724 076364                          O.ORAB  ;  @  OPEN RELATED, ABSOLUTE
3836 076726 076374                          O.ORRB  ;  >  OPEN RELATED, REL. BRANCH
3837 076730 076446                          O.SNGL  ;  S  SINGLE INSTRUCTION MODE
3838 076732 076502                          O.MIN   ;  - MINUS, NEGATES NUMBER TYPED IN
3839 076734 076162                          O.CTLC  ;  ^C EXIT TO MONITOR
3840 076736 076210                          O.CTLF  ;  ^F EXIT TO FIELD SERVICE MODE
3841 076740 076242                          O.CTLE  ;  ^E PROCEED FROM ^D
```

```
3844
3845                                    ; SEMI-COLON PROCESSOR
3846
3847 076742  010203                    O.SEMI: MOV     R2,R3           ;A SEMI-COLON HAS BEEN RECEIVED
3848 076744  010405                            MOV     R4,R5           ;NUMERIC FLAG TO R3, CONTENTS TO R5
3849 076746  105237  075601                    INCB    O.SMFD          ;SET SEMICOLON FOUND FLAG
3850 076752  105037  075600                    CLRB    O.CMFD          ;RESET COMMA FOUND FLAG
3851 076756  000674                            BR      O.DCD1          ;GO BACK FOR MORE
3852
3853                                    ; PROCESS / AND \ - OPEN WORD OR BYTE
3854
3855                                    ;INPUT - IF R2 IS NON-ZERO A NEW REXP HAS BEEN TYPED IN
3856                                    ;INPUT - -ADDRESS OF WORD TO BE OPENED IS IN R4
3857                                            .ENABL  LSB
3858 076760  012737  000002  075566    O.WRD:  MOV     #2,O.BW         ;OPEN WORD
3859 076766  000404                            BR      11$
3860 076770  006104                    1$:     ROL     R4              ;GET THE ADDRESS BACK
3861 076772  012737  000001  075566    O.BYT:  MOV     #1,O.BW         ;OPEN BYTE
3862 077000  005702                    11$:    TST     R2              ;GET VALUE IF R2 IS NON-ZERO
3863 077002  001011                            BNE     14$             ;BRANCH IF NUMBER INPUT
3864 077004  105737  075600                    TSTB    O.CMFD          ;TEST FOR '','AND';'
3865 077010  001402                            BEQ     12$
3866 077012  000137  076510            13$:    JMP     O.ERR           ;ERROR IF PRESENT WITHOUT NUMBER.
3867 077016  105737  075601            12$:    TSTB    O.SMFD
3868 077022  001373                            BNE     13$
3869 077024  000404                            BR      O.WRD1          ;NO NUMBER - REOPEN PREVIOUS LOCATION
3870 077026  010437  075562            14$:    MOV     R4,O.DOT        ;PUT VALUE IN DOT
3871 077032  010437  075560                    MOV     R4,O.CAD        ;    ALSO IN CAD
3872 077036  022737  000001  075566    O.WRD1: CMP     #1,O.BW         ;CHECK BYTE MODE
3873 077044  001407                            BEQ     22$             ;JUMP IF BYTE
3874 077046  013704  075560                    MOV     O.CAD,R4
3875 077052  006204                            ASR     R4              ;MOVE ONE BIT TO CARRY
3876 077054  103745                            BCS     1$              ;JUMP IF ODD ADDRESS
3877 077056  017700  176476                    MOV     @O.CAD,R0       ;GET CONTENTS OF WORD
3878 077062  000402                            BR      23$
3879 077064  117700  176470            22$:    MOVB    @O.CAD,R0       ;GET CONTENTS OF BYTE
3880 077070  004537  100634            23$:    JSR     5,O.CADV        ;GO GET AND TYPE OUT @CAD
3881 077074  022737  000001  075566            CMP     #1,O.BW         ;CHECK IF BYTE MODE.
3882 077102  001212                            BNE     O.DCD3          ;IF NOT WE'RE DONE. ELSE:
3883 077104  112700  000075                    MOVB    #'-,R0          ;TYP '''' AND THEN THE ASCII BYTE
3884 077110  004537  100730                    JSR     5,O.FTYP
3885 077114  117700  176440                    MOVB    @O.CAD,R0
3886 077120  004537  100730                    JSR     5,O.FTYP
3887 077124  112700  000040                    MOVB    #' ,R0
3888 077130  004537  100730                    JSR     5,O.FTYP
3889 077134  000137  076530                    JMP     O.DCD3          ;GO BACK TO DECODER
3890                                            .DSABL  LSB
```

```
3893                                    ; PROCESS CARRIAGE RETURN
3894 077140  004737  101214            O.CRET: JSR     PC,O.CLSE       ;CLOSE LOCATION
3895 077144  000137  076520            O.DCDA: JMP     O.DCD           ;RETURN TO DECODER
3896
3897 077150  000137  076510            O.ERR3: JMP     O.ERR           ; INTERMEDIATE HELP
3898
3899                                    ; PROCESS <LF>, OPEN NEXT WORD
3900
3901 077154  105237  075570            O.OLD:  INCB    O.SEQ           ;SET FLAG TO LATER RESTORE CAD
3902 077160  005737  075566            O.OP1:  TST     O.BW            ;<LF> RECEIVED
3903 077164  001771                    O.ERR2: BEQ     O.ERR3          ;ERROR IF NOTHING IS OPEN
3904 077166  004737  101214                    JSR     PC,O.CLSE       ;CLOSE PRESENT CELL
3905 077172  105737  075570                    TSTB    O.SEQ           ;SHOULD CAD BE RESTORED?
3906 077176  001405                            BEQ     1$              ;BRANCH IF NOT
3907 077200  013737  075562  075560            MOV     O.DOT,O.CAD     ;RESTORE PREVIOUS SEQUENCE
3908 077206  105037  075570                    CLRB    O.SEQ           ;RESET FLAG; NO LONGER NEEDED
3909 077212  063737  075566  075560    1$:     ADD     O.BW,O.CAD      ;GENERATE NEW ADDRESS
3910 077220  013737  075560  075562    O.OP2:  MOV     O.CAD,O.DOT     ;INITIALIZE DOT
3911 077226  004537  101246            O.OP2A: JSR     5,O.CRLF        ;<CR><LF>
3912 077232  013746  075566                    MOV     O.BW,-(SP)      ;SAVE BW
3913 077236  012737  000002  075566            MOV     #2,O.BW         ;SET TO TYPE FULL WORD ADDRESS
3914 077244  013700  075560                    MOV     O.CAD,R0        ;NUMBER TO TYPE
3915 077250  004537  101272                    JSR     5,O.RORA        ; CHECK FORMAT
3916 077254  011637  075566                    MOV     @SP,O.BW        ;RESTORE BW
3917 077260  012700  027534                    MOV     #27534,R0       ;PUT ''/\'' IN R0
3918 077264  022726  000001                    CMP     #1,(SP)+        ;IS IT BYTE MODE?
3919 077270  001401                            BEQ     1$              ;JUMP IF YES
3920 077272  000300                            SWAB    R0              ;TYPE A /
3921 077274  004537  100730            1$:     JSR     5,O.FTYP        ;TYPE THE LOW BYTE OF R0
3922 077300  000656                            BR      O.WRD1          ;GO PROCESS IT
3923
```

```
3926
3927                                    ; PROCESS ^, OPEN PREVIOUS WORD
3928
3929 077302  005737  075566            0.BACK: TST     0.BW            ;  ^ RECEIVED
3930 077306  001726                            BEQ     0.ERR2          ;ERROR IF NOTHING OPEN
3931 077310  004737  101214                    JSR     PC,0.CLSE
3932 077314  163737  075566  075560            SUB     0.BW,0.CAD      ;GENERATE NEW ADDRESS
3933 077322  000736                            BR      0.OP2           ;GO DO THE REST
3934
3935                                    ; B HANDLER - SET AND REMOVE BREAKPOINTS
3936
3937 077324  012700  101370            0.BKPT: MOV     #0.TRTC,R0
3938 077330  006304                            ASL     R4              ;MULTIPLY NUMBER BY TWO
3939 077332  005703                            TST     R3
3940 077334  001423                            BEQ     3$              ;IF R3 IS ZERO GO REMOVE BREAKPOINT
3941 077336  006205                            ASR     R5              ;GET ONE BIT TO CARRY
3942 077340  103514                            BCS     0.ERR1          ;BADNESS IF ODD ADDRESS
3943 077342  006305                            ASL     R5              ;RESTORE ONE BIT
3944 077344  062704  075706                    ADD     #0.ADR1,R4
3945 077350  005702                            TST     R2
3946 077352  001007                            BNE     1$              ;JUMP IF SPECIFIC CELL
3947 077354  020014                    2$:     CMP     R0,@R4          ;IS THIS CELL FREE?
3948 077356  001405                            BEQ     1$              ;JUMP IF YES
3949 077360  020427  075724                    CMP     R4,#0.BKP+0.ADR1;ARE WE AT THE END OF OUR ROPE
3950 077364  103102                            BHIS    0.ERR1          ;YES, THERE IS NOTHING FREE
3951 077366  005724                            TST     (R4)+           ;INCREMENT BY TWO
3952 077370  000771                            BR      2$
3953 077372  020427  075724            1$:     CMP     R4,#0.BKP+0.ADR1
3954 077376  101075                            BHI     0.ERR1          ;ERROR IF TOO LARGE
3955 077400  010514                            MOV     R5,@R4          ;SET BREAKPOINT
3956 077402  000660                            BR      0.DCDA          ;RETURN
3957 077404  005702                    3$:     TST     R2
3958 077406  001410                            BEQ     0.RALL          ;GO REMOVE ALL
3959 077410  020427  000016                    CMP     R4,#0.BKP
3960 077414  101066                            BHI     0.ERR1          ;JUMP IF NUMBER TOO LARGE
3961 077416  010064  075706                    MOV     R0,0.ADR1(R4)   ;CLEAR BREAKPOINT
3962 077422  005064  075730                    CLR     0.CT(R4)        ;CLEAR COUNT ALSO
3963 077426  000646                            BR      0.DCDA
3964 077430  005004                    0.RALL: CLR     R4
3965 077432  012700  101370                    MOV     #0.TRTC,R0
3966 077436  020427  000020            1$:     CMP     R4,#0.BKP+2     ;ALL DONE?
3967 077442  101240                            BHI     0.DCDA          ;JUMP IF YES
3968 077444  010064  075706                    MOV     R0,0.ADR1(R4)   ;RESET BKPT
3969 077450  012764  000003  075752            MOV     #TRT,0.UIN(R4)  ;RESET CONTENTS OF TABLE
3970 077456  005064  075730                    CLR     0.CT(R4)        ;CLEAR COUNT
3971 077462  005724                            TST     (R4)+           ;INCREMENT BY TWO
3972 077464  000764                            BR      1$
3973
```

```
3976
3977                                    ; PROCESS O, COMPUTE OFFSET
3978
3979 077466  022737  000002  075566  O.OFST: CMP     #2,O.BW         ;CHECK WORD MODE
3980 077474  001036                          BNE     O.ERR1          ;ERROR IF NOT CORRECT MODE
3981 077476  012700  000040                  MOV     #' ,R0          ;TYPE ONE BLANK
3982 077502  004537  100730                  JSR     5,O.FTYP        ;  AS A SEPARATOR
3983 077506  005703                          TST     R3              ;WAS SEMI-COLON TYPED?
3984 077510  001430                          BEQ     O.ERR1          ;NO, CALL IT AN ERROR
3985 077512  163705  075560                  SUB     O.CAD,R5        ;COMPUTE
3986 077516  005305                          DEC     R5
3987 077520  005305                          DEC     R5              ;     16 BIT OFFSET
3988 077522  010500                          MOV     R5,R0
3989 077524  004537  100634                  JSR     5,O.CADV        ;NUMBER IN R0 - WORD MODE
3990 077530  010500                          MOV     R5,R0
3991 077532  006200                          ASR     R0              ;DIVIDE BY TWO
3992 077534  103414                          BCS     1$              ;ERROR IF ODD
3993 077536  022700  177600                  CMP     #-200,R0        ;COMPARE WITH -200
3994 077542  003011                          BGT     1$              ;DO NOT TYPE IF OUT OF RANGE
3995 077544  022700  000177                  CMP     #177,R0         ;COMPARE WITH +177
3996 077550  002406                          BLT     1$              ;DO NOT TYPE IF OUT OF RANGE
3997 077552  005337  075566                  DEC     O.BW            ;SET TEMPORARY BYTE MODE
3998 077556  004537  100634                  JSR     5,O.CADV        ;NUMBER IN R0 - BYTE MODE
3999 077562  005237  075566                  INC     O.BW            ;RESTORE WORD MODE
4000 077566  000137  076530          1$:     JMP     O.DCD3          ;ALL DONE
4001
4002 077572  000137  076510          O.ERR1: JMP     O.ERR           ;INTERMEDIATE HELP
```

```
4005                                    ; PROCESS G - GO
4006
4007 077576  105737  07560*     0.GO:   TSTB    C.SMFD          ;WAS ":" TYPED?
4008 077602  001773                     BEQ     0.ERR1          ;BR IF NOT TYPED
4009 077604  005703                     TST     R3              ;WAS K; TYPED?
4010 077606  001771                     BEQ     0.ERR1          ; TYPE ?<CR,LF> IF NOT
4011 077610  112737  000021  075573     MOVB    #0.BKP+3,0.P    ;CLEAR PROCEED
4012 077616  006205                     ASR     R5              ;CHECK LOW ORDER BIT
4013 077620  103764                     BCS     0.ERR1          ;ERROR IF ODD NUMBER
4014 077622  006305                     ASL     R5              ;RESTORE WORD
4015 077624  010537  075700     0.GOGO: MOV     R5,0.UPC        ;SET UP NEW PC
4016 077630  012746  000340             MOV     #0.STM,-(SP)    ;SET HIGH PRIORITY
4017 077634  004737  101202             JSR     PC,0.WST
4018 077640  004537  100534             JSR     5,0.RSTT        ;RESTORE TELETYPE
4019 077644  105037  075572     0.TBIT: CLRB    0.T             ;CLEAR
4020 077650  052737  000020  075702     BIS     #0.TBT,0.UST    ;    BOTH T-BIT FLAGS
4021 077656  105737  075571             TSTB    0.S             ;SEE IF WE NEED A T BIT
4022 077662  001005                     BNE     0.G02           ;IF NOT GO NOW
4023 077664  042737  000020  07570<     BIC     #0.TBT,0.UST    ;CLEAR THE T BIT
4024 077672  004537  100450             JSR     5,0.RSB         ;RESTORE BREAKPOINTS
4025 077676  004037  100416     0.G02:  JSR     0,0.RSR         ;RESTORE REGISTERS
4026 077702  013746  075702             MOV     0.UST,-(SP)     ;    AND STATUS
4027 077706  013746  075700             MOV     0.UPC,-(SP)     ;    AND PC
4028 077712  000240                     NOP                     ; CHANGE TO HALT FOR DEBUGGING
4029 077714  013746  075702             MOV     0.UST,-(SP)     ; MOV IN STATUS FIRST W/O T BIT
4030 077720  042716  177420             BIC     #0.TBT!177400,(SP); SO INTERRUPTS CAN HAPPEN BEFORE
4031 077724  004737  101202             JSR     PC,0.WST        ;  RTT TURNS ON THE T BIT.
4032 077730  000006                     RTT
```

```
                                        ; PROCESS P - PROCEED
                                        ;   ONLY ALLOWED AFTER A BREAKPOINT
                                        
077732  105737  075601        O.PROC: TSTB    O.SMFD          ;WAS ";" TYPED?
077736  001715                  BEQ     O.ERR1          ;BR IF NOT TYPED
077740  113700  075573          MOVB    O.P,R0
077744  105700                  TSTB    R0              ;CHECK LEGALITY OF PROCEED
077746  002711                  BLT     O.ERR1          ;NOT LEGAL
077750  005702                  TST     R2              ;CHECK FOR ILLEGAL COUNT
077752  001307                  BNE     O.ERR1          ;JUMP IF ILLEGAL
077754  005703                  TST     R3              ;WAS COUNT SPECIFIED?
077756  001402                  BEQ     O.PR1           ;NO
077760  010560  075730          MOV     R5,O.CT(R0)     ;YES, PUT AWAY COUNT
077764  012746  000340  O.PR1:  MOV     #O.STM,-(SP)    ;FORCE HIGH PRIORITY
077770  004737  101202          JSR     PC,O.WST
077774  004537  100534          JSR     5,O.RSTT        ;RESTORE TTY
100000  123727  075573  000016  O.C1:   CMPB    O.P,#O.BKP      ;SEE IF A REAL ONE OR A FAKE
100006  003316                  BGT     O.TBIT          ;BRANCH IF FAKE
100010  105737  075571          TSTB    O.S             ;SEE IF SINGLE INSTRUCTION MODE
100014  001313                  BNE     O.TBIT          ;IF SO EXIT NOW
100016  012746  000340          MOV     #O.STM,-(SP)    ;SET HIGH PRIORITY
100022  004737  101202          JSR     PC,O.WST
100026  105237  075572          INCB    O.T             ;SET T-BIT FLAG
100032  052737  000020  075702  BIS     #O.TBT,O.UST    ;SET T-BIT
100040  000716                  BR      O.GO2
```

```
4062                                    ; BREAKPOINT HANDLER
4063 100042 012637 075700       0.BRK:  MOV     (SP)+,0.UPC     ;PRIORITY IS 7 UPON ENTRY
4064 100046 012637 075702               MOV     (SP)+,0.UST     ;SAVE STATUS AND PC
4065 100052 112737 000021 075573        MOVB    #0.BKP+3,0.P    ;TELL ;P THAT WE CAN CONTINUE
4066 100060 004037 100360       0.Bk1:  JSR     0,0.SVR         ;SAVE VARIOUS REGISTERS
4067 100064 105737 075572               TSTB    0.T             ;CHECK FOR T-BIT SET
4068 100070 001265                      BNE     0.TBIT          ;JUMP IF SET
4069 100072 004537 100602               JSR     5,0.REM         ;REMOVE BREAKPOINTS
4070 100076 105737 075704               TSTB    0.PRI           ;CHECK IF PRIORITY
4071 100102 100003                      BPL     2$              ; IS AS SAME AS USER PGM
4072 100104 113705 075702               MOVB    0.UST,R5        ;PICK UP USER UST IF SO
4073 100110 000407                      BR      3$
4074 100112 113705 075704       2$.     MOVB    0.PRI,R5        ;OTHERWISE PICK UP ACTUAL PRIORITY
4075 100116 000257                      CCC                     ;CLEAR CARRY
4076 100120 106005                      RORB    R5              ;SHIFT LOW ORDER BITS
4077 100122 106005                      RORB    R5              ;  INTO
4078 100124 106005                      RORB    R5              ;    HIGH ORDER
4079 100126 106005                      RORB    R5              ;      POSITION
4080 100130 042705 177420       3$:     BIC     #0.TBT.177400,R5;CLEAR POSSIBLE T BIT (S/I MODE)
4081 100134 010546                      MOV     R5,-(SP)        ;PUT THE STATUS AWAY WHERE IT BELONGS
4082 100136 004737 101202               JSR     PC,0.WST
4083 100142 013705 075700               MOV     0.UPC,R5        ;GET PC, IT POINTS TO THE TRT
4084 100146 105737 075571               TSTB    0.S             ;SEE IF IT WAS SINGLE INSTRUCTION FUN
4085 100152 100432                      BMI     14$             ;IF SO HANDLE THERE
4086 100154 005745                      TST     -(R5)
4087 100156 010537 075700               MOV     R5,0.UPC
4088 100162 012704 000016               MOV     #0.BKP,R4       ;GET A COUNTER
4089 100166 020564 075706       11$:    CMP     R5,0.ADR1(R4)   ;COMPARE WITH LIST
4090 100172 001426                      BEQ     12$             ;JUMP IF FOUND
4091 100174 005304                      DEC     R4
4092 100176 005304                      DEC     R4
4093 100200 002372                      BGE     11$             ;RE-LOOP UNTIL FOUND
4094 100202 004537 100500               JSR     5,0.SVTT        ;SAVE TELETYPE STATUS
4095 100206 004537 101246               JSR     5,0.CRLF
4096 100212 012704 101366               MOV     #0.BD,R4        ;ERROR, NOTHING FOUND
4097 100216 012703 101367               MOV     #0.BD+1,R3
4098 100222 004537 101126               JSR     5,0.TYPE        ;OUTPUT 'BE'' FOR BAD ENTRY
4099 100226 010500                      MOV     R5,R0
4100 100230 062737 000002 075700        ADD     #2,0.UPC        ;POP OVER THE ADJUSTMENT ABOVE
4101 100236 000444                      BR      13$             ; OR CONTINUE
```

```
4104 100240 112704 000020          14$:  MOVB   #0.BKP+2,R4     ;SET BREAK POINT HIGH + 1
4105 100244 010564 075706                MOV    R5,0.ADR1(R4)   ;STORE NEXT PC VALUE FOR TYPE OUT
4106 100250 110437 075573          12$:  MOVB   R4,0.P          ;ALLOW PROCEED
4107 100254 005364 075730                DEC    0.CT(R4)
4108 100260 003247                       BGT    0.C1            ;JUMP IF REPEAT
4109 100262 012764 000001 075730         MOV    #1,0.CT(R4)     ;RESET COUNT TO 1
4110 100270 004537 100500                JSR    5,0.SVTT        ;SAVE TELETYPE STATUS, R4 IS SAFE
4111 100274 012700 000102                MOV    #'B,R0
4112 100300 004537 100730                JSR    5,0.FTYP        ;TYPE 'B'
4113 100304 113700 075573                MOVB   0.P,R0          ;CONVERT BREAKPOINT NUMBER TO ASCII
4114 100310 062700 000140                ADD    #140,R0
4115 100314 006200                       ASR    R0
4116 100316 004537 100730                JSR    5,0.FTYP
4117 100322 012700 000073                MOV    #':,R0
4118 100326 004537 100730                JSR    5,0.FTYP        ; TYPE
4119 100332 012737 000002 075566         MOV    #2,0.BW         ; SET WORD MODE
4120 100340 113704 075573                MOVB   0.P,R4
4121 100344 016400 075706                MOV    0.ADR1(R4),R0   ;GET ADDRESS OF BREAK
4122 100350 004537 101272          13$:  JSR    5,0.RORA        ; CHECK FORMAT
4123 100354 000137 076520                JMP    0.DCD           ;GO TO DECODER
```

```
                                ; SAVE REGISTERS R0-R6
                                ;   INTERNAL STACK

100360  012637  075564          C.SVR:  MOV     (SP)+,0.XXX     ;PICK REGISTER FROM STACK AN  SAVE
100364  010637  075676                  MOV     SP,0.USP        ;SAVE USER STACK ADDRESS
100370  012706  075676                  MOV     #0.USP,SP       ;SET TO INTERNAL STACK
100374  010546                          MOV     R5,-(SP)        ;SAVE
100376  010446                          MOV     R4,-(SP)        ; REGISTERS
100400  010346                          MOV     R3,-(SP)        ;1
100402  010246                          MOV     R2,-(SP)        ; THRU
100404  010146                          MOV     R1,-(SP)        ;    5
100406  013746  075564                  MOV     0.XXX,-(SP)     ;PUT SAVED REGISTER ON STACK
100412  005746                          TST     -(SP)
100414  000200                          RTS     R0

                                ; RESTORE REGISTERS R0-R6

100416  005726                  0.RSR:  TST     (SP)+           ;POP THE EXTRA CELL
100420  012637  075564                  MOV     (SP)+,0.XXX     ;GET R0 FROM STACK
100424  012601                          MOV     (SP)+,R1        ;RESTORE
100426  012602                          MOV     (SP)+,R2        ; REGISTERS
100430  012603                          MOV     (SP)+,R3        ;  1
100432  012604                          MOV     (SP)+,R4        ;  THRU
100434  012605                          MOV     (SP)+,R5        ;    5
100436  013706  075676                  MOV     0.USP,SP        ;RESTORE USER STACK
100442  013746  075564                  MOV     0.XXX,-(SP)     ;PUT R0 ON USER STACK
100446  000200                          RTS     R0
```

```
                                        ; RESTORE BREAKPOINTS 0-7
                                        ;
100450  012704  000016          0.RSB:  MOV     #0.BKP,R4       ;RESTORE ALL BREAKPOINTS
100454  017464  075706  075752  1$:     MOV     @0.ADR1(R4),0.UIN(R4);SAVE CONTENTS
100462  013774  101370  075706          MOV     0.TRT(,@0.ADR1(R4);REPLACE WITH TRAP
100470  005304                          DEC     R4
100472  005304                          DEC     R4
100474  002367                          BGE     1$              ;RE-LOOP UNTIL DONE
100476  000205                          RTS     R5              ;  THEN QUIT
                                        ;
                                        ; SAVE TELETYPE STATUS
                                        ;
100500  113737  177560  075574  0.SVTT: MOVB    0.RCSR,0.CSR1   ;SAVE R C/SR
100506  113737  177564  075575          MOVB    0.TCSR,0.CSR2   ;SAVE T C/SR
100514  105037  177560                  CLRB    0.RCSR          ;CLEAR ENABLE AND MAINTENANCE
100520  105037  177564                  CLRB    0.TCSR          ;  BITS IN BOTH C/SR
100524  105737  177564          1$:     TSTB    0.TCSR          ;LOOP UNTIL READY BIT COMES ON
100530  100375                          BPL     1$              ;BR IF BIT NOT ON
100532  000205                          RTS     R5
                                        ; RESTORE TELETYPE STATUS
                                        ;
100534  004537  101246          0.RSTT: JSR     5,0.CRLF
100540  105737  177564                  TSTB    0.TCSR          ;WAIT READY
100544  100375                          BPL     .-4             ;  ON PRINTER
100546  032737  004000  177560          BIT     #4000,0.RCSR    ;CHECK BUSY FLAG
100554  001403                          BEQ     1$              ;SKIP READY LOOP IF NOT BUSY
100556  105737  177560                  TSTB    0.RCSR          ;WAIT READY
100562  100375                          BPL     .-4             ;  ON READER
100564  113737  075574  177560  1$:     MOVB    0.CSR1,0.RCSR   ;RESTORE
100572  113737  075575  177564          MOVB    0.CSR2,0.TCSR   ;  THE STATUS REGISTERS
100600  000205                          RTS     R5
                                        ;
                                        ; REMOVE BREAKPOINTS 0-7
                                        ;   IN THE OPPOSITE ORDER OF SETTING
                                        ;
100602  105737  075571          0.REM:  TSTB    0.S             ;SEE IF SINGLE INSTRUCTION IS GOING
100606  001011                          BNE     2$              ;EXIT IF SO
100610  005004                          CLR     R4              ;REMOVE ALL BREAKPOINTS
100612  016474  075752  075706  1$:     MOV     0.UIN(R4),@0.ADR1(R4)   ;CLEAR BREAKPOINT
100620  005204                          INC     R4
100622  005204                          INC     R4
100624  020427  000016                  CMP     R4,#0.BKP
100630  003770                          BLE     1$              ;RE-LOOP UNTIL DONE
100632  000205                  2$.     RTS     R5              ;THEN QUIT
```

```
4201                                    ; TYPE OUT CONTENTS OF WORD OR BYTE WITH ONE TRAILING SPACE
4202                                    ; WORD IS IN R0
4203
4204 100634  012703  000006            0.CADV: MOV     #6,R3           ;# OF DIGITS
4205 100640  012704  177776                    MOV     #-2,R4          ;# OF BITS FIRST-3
4206 100644  022737  000001  075566            CMP     #1,0.BW         ;SEE IF WORD MODE
4207 100652  001004                            BNE     3$              ;BRANCH IF SO
4208 100654  162703  000003                    SUB     #3,R3           ;ONLY DO 3 DIGITS
4209 100660  005204                            INC     R4              ;DO 2 BITS FIRST
4210 100662  000300                            SWAB    R0              ;AND TURN R0 AROUND
4211 100664  010046                    3$:     MOV     R0,-(SP)        ;SAVE R0
4212 100666  062704  000003            2$:     ADD     #3,R4           ;COMPUTE THE NUMBER OF BITS TO DO
4213 100672  005000                            CLR     R0
4214 100674  006116                    1$:     ROL     (SP)            ;GET A BIT
4215 100676  006100                            ROL     R0              ;STORE IT AWAY
4216 100700  005304                            DEC     R4              ;DECREMENT COUNTER
4217 100702  003374                            BGT     1$              ;LOOP IF MORE BITS NEEDED
4218 100704  062700  000060                    ADD     #'0,R0          ;CONVERT TO ASCII
4219 100710  004537  100730                    JSR     R5,0.FTYP       ;TYPE IT
4220 100714  005303                            DEC     R3              ;SEE IF MORE DIGITS TO DO
4221 100716  003363                            BGT     2$              ;LOOP IF SO
4222 100720  112700  000040                    MOVB    #' ,R0          ;SET UP FOR TRAILING SPACE
4223 100724  005726                            TST     (SP)+           ;GET RID OF JUNK
4224 100726  000400                            BR      0.FTYP
4225
4226
4227                                    ; TYPE ONLY ONE CHARACTER (CONTAINED IN R0)
4228
4229 100730  105737  177564            0.FTYP: TSTB    0.TCSR
4230 100734  100375                            BPL     0.FTYP
4231 100736  042700  177400                    BIC     #177400,R0      ;CLEAR HIGH BYTE,SHOULD NOT
4232                                                                    ;CONTAIN INPORTANT INFO.
4233 100742  001416                            BEQ     3$
4234 100744  022700  000176                    CMP     #176,R0         ;PRINT ? FOR 177;16-37
4235 100750  103411                            BLO     2$              ; 1-10 AND 200-377.
4236 100752  022700  000037                    CMP     #37,R0
4237 100756  103410                            BLO     3$
4238 100760  022700  000015                    CMP     #15,R0
4239 100764  103403                            BLO     2$
4240 100766  022700  000010                    CMP     #10,R0
4241 100772  103402                            BLO     3$
4242 100774  012700  000077            2$:     MOV     #'?,R0
4243 101000  110037  177566            3$:     MOVB    R0,0.TDB
4244 101004  000205                    0.TYP1: RTS     R5
```

```
                                ; GENERAL CHARACTER INPUT ROUTINE -- ODT'1x
                                ; CHARACTER INPUT GOES TO R0
                                
101006  105737  177560  O.GET:  TSTB    O.RCSR          ;WAIT FOR
101012  100375                  BPL     O.GET           ;  INPUT FROM KBD
101014  113700  177562          MOVB    O.RDB,R0        ;GET CHARACTER - STRIP OFF PARITY
101020  042700  177600          BIC     #177600,R0      ;STRIP OFF PARITY FROM CHARACTER
101024  122700  000003          CMPB    #3,R0           ;IS IT ^C?
101030  001435                  BEQ     3$              ;IF SO, DO NOT ECHO
101032  122700  000006          CMPB    #6,R0           ;IS IT ^F?
101036  001432                  BEQ     3$              ;IF SO, DO NOT ECHO
101040  122700  000005          CMPB    #5,R0           ;IS IT ^E?
101044  001427                  BEQ     3$              ;IF SO, DO NOT ECHO
101046  105737  075602          TSTB    O.SCRN          ;SHOULD WE ECHO <LF>?
101052  001003                  BNE     2$              ;BR IF YES
101054  120027  000012          CMPB    R0,#012         ;SEE IF A <LF>
101060  001421                  BEQ     3$              ;IF SO SAVE THE PAPER
101062  120027  000173  2$:     CMPB    R0,#173
101066  002005                  BGE     1$
101070  122700  000140          CMPB    #140,R0         ;TEST FOR LOWER CASE
101074  002002                  BGE     1$
101076  162700  000040          SUB     #40,R0          ;CHAR IS LC-CONVERT TO UPPER CASE
101102  004537  100730  1$:     JSR     5,O.FTYP        ;ECHO CHARACTER
101106  001737                  BEQ     O.GET           ;IGNORE NULLS
101110  105737  075602          TSTB    O.SCRN          ;SHOULD WE PASS ON SPACES?
101114  001003                  BNE     3$              ;BR IF YES
101116  122700  000040          CMPB    #40,R0          ;CHECK FOR SPACES
101122  001731                  BEQ     O.GET           ;IGNORE SPACES
101124  000205  3$:     RTS     R5
```

```
                                ; GENERAL CHARACTER OUTPUT ROUTINE - ODT11X
                                ;  ADDRESS OF FIRST BYTE IN R4,
                                ;  ADDRESS OF LAST BYTE IN R3, (R3)>(R4)
                                ; EXPECTS LOCS 56,57 TO BE INITIALIZED BY MONITOR FOR FILL
                                ; CHARACTERISTICS OF TERMINAL
                                ;  56=CHAR TO BE FILLED AFTER
                                ;  57=# OF NULLS TO FILL WITH

101126  020304                O.TYPE: CMP     R3,R4           ;CHECK FOR COMPLETION
101130  103725                        BLO     O.TYP1          ; EXIT WHEN DONE
101132  112400                        MOVB    (R4)+,R0        ;GET A CHARACTER
101134  004537  100730                JSR     5,O.FTYP        ;TYPE ONE CHARACTER
101140  120037  003002                CMPB    R0,@#$FILLC     ;COMPARE CHAR AGAINST FILL REQUIREMENT
101144  001370                        BNE     O.TYPE          ;NO FILL NEEDED
101146  113737  002451  075576        MOVB    @#$FILLS,O.FIL  ;FILL COUNT INTO TEMP
101154  005000                        CLR     R0              ;FILL WITH NULLS
101156  004537  100730        2$:     JSR     R5,O.FTYP       ;TYPE NULLS
101162  105337  075576                DECB    O.FIL           ;DECREASE COUNT
101166  003373                        BGT     2$              ;BRANCH IF NOT DONE
101170  000756                        BR      O.TYPE          ;LOOP UNTIL DONE
```

```
4300                                    ;SUBROUTINE TO READ THE PS INDEPENDENT OF MACHINE
4301
4302 101172  013737  177776  075702  0.RRST: MOV     ST,0.UST        ;STORE THE STATUS IN USER
4303                                                                  ;STATUS AREA.FOR AN LSI
4304                                                                  ;THIS IS CHANGED TO
4305                                                                  ;MFPS 0.UST
4306 101200  000207                          RTS     PC
4307
4308                                    ;SUBROUTINE TO WRITE PS INDEPENDENT OF MACHINE
4309                                    ;CALL ROUTINE WITH PS VALUE
4310                                    ;ON THE STACK
4311
4312 101202  016637  000002  177776  0.WST:  MOV     2(SP),ST        ;STORE NEW PS VALUE
4313                                                                  ;THIS INSTRUCTION IS CHANGED FOR LSI
4314                                                                  ;TO MTPS 2(SP)
4315 101210  012616                          MOV     (SP)+,(SP)      ;PUT RETURN PC OVER SUB. ARGUMENT
4316 101212  000207                          RTS     PC              ;TO RETURN WITHOUT IT ON THE STACK
4317                                    ; CLOSE WORD OR BYTE AND EXIT,
4318                                    ; UPON ENTERING, R2 HAS NUMERIC FLAG, R4 HAS CONTENTS
4319
4320                                            .ENABL  LSB
4321 101214  005702                    0.CLSE: TST     R2              ;IF NO NUMBER WAS TYPED THERE IS
4322 101216  001412                            BEQ     1$              ;NO CHANGE TO THE OPEN CELL
4323 101220  022737  000001  075566            CMP     #1,0.BW
4324 101226  001404                            BEQ     2$              ;JUMP IF BYTE MODE
4325 101230  101005                            BHI     1$              ;JUMP IF ALREADY CLOSED
4326 101232  010477  174322                    MOV     R4,@0.CAD       ;STORE WORD
4327 101236  000402                            BR      1$
4328 101240  110477  174314            2$:     MOVB    R4,@0.CAD       ;STORE BYTE
4329 101244  000207                    1$:     RTS     PC
4330 101246  012703  101317            0.CRLF: MOV     #0.CR+1,R3      ;LWA <CR,LF>
4331 101252  000402                            BR      3$
4332 101254  012703  101320            0.CRLS: MOV     #0.CR+2,R3      ;LWA <LR,LF>*
4333 101260  012704  101316            3$:     MOV     #0.CR,R4        ;FWA
4334 101264  004537  101126                    JSR     5,0.TYPE        ;TYPE SOMETHING
4335 101270  000205                            RTS     R5
4336                                            .DSABL  LSB
```

```
                                        ;SUBROUTINE O.RORA
                                        ;FUNCTION:                          THE
                                        ;ADDRESS WILL BE PRINTED IN ABSOLUTE FORM
                                        ;INPUT: THE ADDRESS TO BE PRINTED IS IN R0.
                                        ;DATA SAVED:  R0 CONTAINING THE ADDRESS TO BE
                                        ;PRINTED, AND LOCATION O.CAD CONTAINING
                                        ;THE CURRENT ADDRESS WERE SAVED AND RESTORED.
                                        ;CALLED:  JSR 5,O.RORA

101272  004537  100634          O.RORA: JSR     5,O.CADV        ;PRINT ABSOLUTE ADDRESS
101276  000205                          RTS     R5
101300     012                  O.ID:    .BYTE   012
101301     015                           .BYTE   015
101302     040                           .BYTE   40
101303     117      104      124         .ASCII /ODT (CEMKA)/
101306     040      050      103
101311     105      115      113
101314     101      051
         101315                 O.IDND .-1
101316     015                  O.CR:    .BYTE   015     ;  <CR>
101317     012                           .BYTE   012     ;  <LF>
101320     052                           .BYTE   '*      ;  *

101321     073                  O.LGCH:  .BYTE   ';      ;
101322     057                           .BYTE   '/      ;  /
101323     134                           .BYTE   '\      ;  \     (BACK SLASH)
101324     015                           .BYTE   015     ;  CARRIAGE RETURN
101325     044                           .BYTE   '$      ;  $
101326     107                           .BYTE   'G      ;  G
101327     012                           .BYTE   012     ;  <LF>
101330     137                           .BYTE   '_      ;  _     (BACK ARROW)
101331     074                           .BYTE   '<      ;  <
101332     136                           .BYTE   '^      ;  ^     (UP ARROW)
101333     117                           .BYTE   'O      ;  O
101334     102                           .BYTE   'B      ;  B
101335     120                           .BYTE   'P      ;  P
101336     100                           .BYTE   '@      ;  @
101337     076                           .BYTE   '>      ;  >
101340     123                           .BYTE   'S      ;  S
101341     055                           .BYTE   '-      ;  -
101342     003                           .BYTE   003     ;CTRL C
101343     006                           .BYTE   006     ;CTRL F
101344     005                           .BYTE   005     ;CTRL E
         000024                 O.CLGT   =       .-O.LGCH                ;TABLE LENGTH

101345     123                  O.TL:    .BYTE   'S      ;DO        1
101346     120                           .BYTE   'P      ;NOT       2
101347     115                           .BYTE   'M      ;CHANGE    3
101350     000                           .BYTE   0       ;THE       4
101351     000                           .BYTE   0       ;ORDER     5
101352     103                           .BYTE   'C      ;          6
101353     106                           .BYTE   'F      ;          7
101354     122                           .BYTE   'R      ;         10
101355     000                           .BYTE   0       ;         11
101356     000                           .BYTE   0       ;         12
101357     000                           .BYTE   0       ;         13
101360     000                           .BYTE   0       ;         14
```

```
 4393 101361      000                          .BYTE   0       ;       15
 4394 101362      000                          .BYTE   0       ;       16
 4395 101363      000                          .BYTE   0       ;       17
 4396 101364      102                          .BYTE   'B      ;       20
 4397            000020          O.LG    =       .-O.TL
 4398                                    .EVEN
 4399 101366  042502              O.BD:   .WORD   'BE
 4400 101370  000003              O.TRTC: TRT                             ;TRACE TRAP PROTOTYPE
```

```
                                        .SBTTL  TABLE   ERROR POINTER

                                ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                                ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS (ERRPC).
                                ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS.

                                ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                ;*      DH              ;;POINTS TO THE DATA HEADER
                                ;*      DT              ;;POINTS TO THE DATA
                                ;*      DF              ;;POINTS TO THE DATA FORMAT

101372                          $ERRTB: ;ERROR  1
101372  104530                          EM24
101374  110307                          DH13
101376  102504                          DT13
101400  103103                          DF11
                                        ;ERROR  2
101402  103220                          EM2
101404  107366                          DH1
101406  102252                          DT1
101410  102743                          DF2
                                        ;ERROR  3
101412  103256                          EM3
101414  107446                          DH3
101416  102302                          DT3
101420  103071                          DF9
                                        ;ERROR  4
101422  103311                          EM4
101424  107446                          DH3
101426  102312                          DT4
101430  103071                          DF9
                                        ;ERROR  5
101432  103357                          EM5
101434  107507                          DH5
101436  102322                          DT5
101440  102743                          DF2
                                        ;ERROR  6
101442  103434                          EM6
101444  107507                          DH5
101446  102322                          DT5
101450  102743                          DF2
                                        ;ERROR  7
101452  103461                          EM7
101454  107507                          DH5
101456  102322                          DT5
101460  102743                          DF2
                                        ;ERROR  10
101462  103633                          EM10
101464  107366                          DH1
101466  102252                          DT1
101470  102743                          DF2
```

```
4459                                    ;ERROR  11
4460 101472  103677                     EM11
4461 101474  107664                     DH7
4462 101476  102362                     DT7
4463 101500  102767                     DF3
4464                                    ;ERROR  12
4465 101502  103677                     EM11
4466 101504  107664                     DH7
4467 101506  102362                     DT7
4468 101510  103004                     DF4
4469                                    ;ERROR  13
4470 101512  103721                     EM12
4471 101514  110145                     DH10
4472 101516  102444                     DT10
4473 101520  102743                     DF2
4474                                    ;ERROR  14
4475 101522  103677                     EM11
4476 101524  107664                     DH7
4477 101526  102362                     DT7
4478 101530  103021                     DF5
4479                                    ;ERROR  15
4480 101532  103677                     EM11
4481 101534  107664                     DH7
4482 101536  102362                     DT7
4483 101540  103036                     DF6
4484                                    ;ERROR  16
4485 101542  103745                     EM13
4486 101544  110307                     DH13
4487 101546  102504                     DT13
4488 101550  103103                     DF11
4489                                    ;ERROR  17
4490 101552  103777                     EM14
4491 101554  110307                     DH13
4492 101556  102504                     DT13
4493 101560  103103                     DF11
4494                                    ;ERROR  20
4495 101562  104043                     EM15
4496 101564  110307                     DH13
4497 101566  102504                     DT13
4498 101570  103103                     DF11
4499                                    ;ERROR  21
4500 101572  104111                     EM16
4501 101574  110243                     DH11
4502 101576  102466                     DT11
4503 101600  102743                     DF2
4504                                    ;ERROR  22
4505 101602  104137                     EM17
4506 101604  107664                     DH7
4507 101606  102362                     DT7
4508 101610  103021                     DF5
4509                                    ;ERROR  23
4510 101612  104177                     EM18
4511 101614  110006                     DH8
4512 101616  102416                     DT8
4513 101620  103076                     DF10
```

```
4516                                    ;ERROR  24
4517 101622  104256                     EM19
4518 101624  110307                     DH13
4519 101626  102504                     DT13
4520 101630  103103                     DF11
4521                                    ;ERROR  25
4522 101632  104333                     EM20
4523 101634  110307                     DH13
4524 101636  102504                     DT13
4525 101640  103103                     DF11
4526                                    ;ERROR  26
4527 101642  000000                     0               ;NO MESSAGE
4528 101644  110272                     DH12
4529 101646  102476                     DT12
4530 101650  102743                     DF2
4531                                    ;ERROR  27
4532 101652  104415                     EM21
4533 101654  110243                     DH11
4534 101656  102466                     DT11
4535 101660  102743                     DF2
4536                                    ;ERROR  30
4537 101662  104454                     EM22
4538  01664  110307                     DH13
4539 101666  102504                     DT13
4540 101670  103103                     DF11
4541                                    ;ERROR  31
4542 101672  000000                     0               ;NO MESSAGE
4543 101674  110415                     DH14
4544 101676  102530                     DT14
4545 101700  102743                     DF2
4546                                    ;ERROR  32
4547 101702  104501                     EM23
4548 101704  107507                     DH5
4549 101706  102322                     DT5
4550 101710  102743                     DF2
4551                                    ;ERROR  33
4552 101712  106025                     EM38
4553 101714  110672                     DH17
4554 101716  102264                     DT2
4555 101720  103116                     DF13
4556                                    ;ERROR  34
4557 101722  104607                     EM25
4558 101724  110533                     DH15
4559 101726  102556                     DT16
4560 101730  103053                     DF7
4561                                    ;ERROR  35
4562 101732  104634                     EM26
4563 101734  110655                     DH16
4564 101736  102610                     DT17
4565 101740  102767                     DF3
4566                                    ;ERROR  36
4567 101742  103521                     EM8
4568 101744  110672                     DH17
4569 101746  102616                     DT18
4570 101750  103116                     DF13
```

```
 4573                                    ;ERROR  37
 4574 101752  103556                     EM9
 4575 101754  110106                     DH9
 4576 101756  102432                     DT9
 4577 101760  102743                     DF2
 4578                                    ;ERROR  40
 4579 101762  104705                     EM27
 4580 101764  110655                     DH16
 4581 101766  102610                     DT7
 4582 101770  103067                     DF8
 4583                                    ;ERROR  41
 4584 101772  104774                     EM28
 4585 101774  110672                     DH17
 4586 101776  102634                     DT19
 4587 102000  103116                     DF13
 4588                                    ;ERROR  42
 4589 102002  105624                     EM35
 4590 102004  107664                     DH7
 4591 102006  102362                     DT7
 4592 102010  102767                     DF3
 4593                                    ;ERROR  43
 4594 102012  105027                     EM29
 4595 102014  107664                     DH7
 4596 102016  102362                     DT7
 4597 102020  102767                     DF3
 4598                                    ;ERROR  44
 4599 102022  105111                     EM30
 4600 102024  107664                     DH7
 4601 102026  102362                     DT7
 4602 102030  103021                     DF5
 4603                                    ;ERROR  45
 4604 102032  105230                     EM31
 4605 102034  107664                     DH7
 4606 102036  102362                     DT7
 4607 102040  102767                     DF3
 4608                                    ;ERROR  46
 4609 102042  105330                     EM32
 4610 102044  107664                     DH7
 4611 102046  102362                     DT7
 4612 102050  102767                     DF3
 4613                                    ;ERROR  47
 4614 102052  105435                     EM33
 4615 102054  107664                     DH7
 4616 102056  102362                     DT7
 4617 102060  102767                     DF3
 4618                                    ;ERROR  50
 4619 102062  105543                     EM34
 4620 102064  111023                     DH19
 4621 102066  102700                     DT22
 4622 102070  103114                     DF12
 4623                                    ;ERROR  5
 4624 102072  105711                     EM36
 4625 102074  107615                     DH6
 4626 102076  102346                     DT6
 4627 102100  102743                     DF2
```

```
4630                                    ;ERROR  52
4631 102102  105760                     EM37
4632 102104  110672                     DH17
4633 102106  102616                     DT18
4634 102110  103116                     DF13
4635                                    ;ERROR  53
4636 102112  106133                     EM39
4637 102114  110672                     DH17
4638 102116  102616                     DT18
4639 102120  103116                     DF13
4640                                    ;ERROR  54
4641 102122  106220                     EM40
4642 102124  107423                     DH2
4643 102126  102652                     DT20
4644 102130  102743                     DF2
4645                                    ;ERROR  55
4646 102132  106272                     EM41
4647 102134  110746                     DH18
4648 102136  102662                     DT21
4649 102140  103103                     DF11
4650                                    ;ERROR  56
4651 102142  106374                     EM42
4652 102144  110746                     DH18
4653 102146  102662                     DT21
4654 102150  103103                     DF11
4655                                    ;ERROR  57
4656 102152  103134                     EM1
4657 102154  000000                     0
4658 102156  000000                     0
4659 102160  000000                     0
4660                                    ;ERROR  60
4661 102162  106477                     EM43
4662 102164  111037                     DH20
4663 102166  102706                     DT23
4664 102170  102743                     DF2
4665                                    ;ERROR  61
4666 102172  106575                     EM44
4667 102174  111056                     DH21
4668 102176  102714                     DT24
4669 102200  102743                     DF2
4670                                    ;ERROR  62
4671 102202  106672                     EM45
4672 102204  111037                     DH20
4673 102206  102706                     DT23
4674 102210  102743                     DF2
4675                                    ;ERROR  63
4676 102212  106773                     EM46
4677 102214  110672                     DH17
4678 102216  102264                     DT2
4679 102220  103116                     DF13
4680                                    ;ERROR  64
4681 102222  107062                     EM47
4682 102224  110655                     DH16
4683 102226  102610                     DT17
4684 102230  102767                     DF3
```

ABLE ERROR POINTER

```
4687                                    ;ERROR  65
4688 102232  107170                     EM48
4689 102234  111063                     DH22
4690 102236  102652                     DT20
4691 102240  102743                     DF2
4692                                    ;ERROR  66
4693 102242  107267                     EM49
4694 102244  111111                     DH23
4695 102246  102720                     DT25
4696 102250  103125                     DF14
```

```
                                                .SBTTL  ERROR DATA TAGS (DT)
102252 002024 002040 002050 DT1:    .WORD   ERRPC,ADDRESS,GOOD,BAD,0
102260 002056 000000
102264 002024 002304 002656 DT2:    .WORD   ERRPC,DUMMY,SLFLAG,SLFLAG+2,SLFLAG+4,SLFLAG+6,0
102272 002660 002662 002664
102300 000000
102302 002024 002042 002074 DT3:    .WORD   ERRPC,PADDRESS,PARCNT,0
102310 000000
102312 002024 002040 002072 DT4:    .WORD   ERRPC,ADDRESS,NEMCNT,0
102320 000000
102322 002024 177766 177744 DT5:    .WORD   ERRPC,CPUERR,MEMERR,HIADRS,LOADRS,MMR0,MMR1,MMR2,MMR3,0
102330 177742 177740 177572
102336 177574 177576 172516
102344 000000
102346 002024 002522 002466 DT6:    .WORD   ERRPC,APTCORE,MJSIZE,APTMOS,MKSIZE,0
102354 002524 002470 000000
102362 002024 002304 002040 DT7:    .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,GOOD,BAD,BADXOR
102370 002304 002050 002056
102376 002064
102400 002304 002304 002304         .WORD   DUMMY,DUMMY,DUMMY,DUMMY,DUMMY,DUMMY,0
102406 002304 002304 002304
102414 000000
102416 002040 002050 002056 DT8:    .WORD   ADDRESS,GOOD,BAD,GDSWITCH,BDSWITCH,0
102424 002476 002500 000000
102432 002024 177766 177744 DT9:    .WORD   ERRPC,CPUERR,MEMERR,CSRNO,0
102440 002256 000000
102444 002306 002310 002312 DT10:   .WORD   DETR0,DETR1,DETR2,DETR3,DETR4,DETR5,DETSP,DETPSW,0
102452 002314 002316 002320
102460 002322 002324 000000
102466 002024 002144 002146 DT11:   .WORD   ERRPC,CSR,CSR+2,0
102474 000000
102476 002144 002146 000000 DT12:   .WORD   CSR,CSR+2,0
102504 002024 002304 002040 DT13:   .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,TSTDAT,TSTDAT+2,CHECK,CSR,CSR+2,0
102512 002304 002344 002346
102520 002404 002144 002146
102526 000000
102530 177744 177750 177746 DT14:   .WORD   MEMERR,MAINT,CONTRL,HIADRS,LOADRS,CPUERR,MMR0,MMR1,MMR2,MMR3,0
102536 177742 177740 177766
102544 177572 177574 177576
102552 172516 000000
102556 002024 002304 002304 DT16:   .WORD   ERRPC,DUMMY,DUMMY,GOOD,GOOD2,GOOD3
102564 002050 002052 002054
102572 002056 002060 002062         .WORD   BAD,BAD2,BAD3,DUMMY,DUMMY,DUMMY,0
102600 002304 002304 002304
102606 000000
102610 002024 002304 000000 DT17:   .WORD   ERRPC,DUMMY,0
102616 002024 002304 002646 DT18:   .WORD   ERRPC,DUMMY,PORTCOUNT,PORTCOUNT+2,PORTCOUNT+4,PORTCOUNT+6,0
102624 002650 002652 002654
102632 000000
102634 002024 002304 002606 DT19:   .WORD   ERRPC,DUMMY,PORTDIR,PORTDIR+2,PORTDIR+4,PORTDIR+6,0
102642 002610 002612 002614
102650 000000
102652 002024 002050 002056 DT20:   .WORD   ERRPC,GOOD,BAD,0
102660 000000
102662 002024 002304 002040 DT21:   .WORD   ERRPC,DUMMY,ADDRESS,DUMMY,GOOD,BAD,0
102670 002304 002050 002056
102676 000000
```

ERROR DATA TAGS (DT)

```
 4722 102700 002024 002304 000000 DT22:   .WORD   ERRPC,DUMMY,0
 4723 102706 002024 002056 000000 DT23:   .WORD   ERRPC,BAD,0
 4724 102714 002024 000000        DT24:   .WORD   ERRPC,0
 4725 102720 002024 002304 002646 DT25:   .WORD   ERRPC,DUMMY,PORTCOUNT,PORTCOUNT+2,PORTCOUNT+4,PORTCOUNT+6,HA.
      102726 002650 002652 002654
      102734 002056 000000
```

```
 4728                                                   .SBTTL  ERROR DATA FORMATS (DF)
 4729 102740    000     016     016    DF1:    .BYTE   0,14.,14.
 4730 102743    000     000     000    DF2:    .BYTE   0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
      102746    000     000     000
      102751    000     000     000
      102754    000     000     000
      102757    000     000     000
      102762    000     000     000
      102765    000     000
 4731 102767    000     005     000    DF3:    .BYTE   0,5,0,9.,0,0,0,10.,3,6,2,4,12.
      102772    011     000     000
      102775    000     012     003
      103000    006     002     004
      103003    014
 4732 103004    000     005     000    DF4:    .BYTE   0,5,0,9.,0,8.,8.,10.,3,6,2,4,12.
      103007    011     000     010
      103012    010     012     003
      103015    006     002     004
      103020    014
 4733 103021    000     005     000    DF5:    .BYTE   0,5,0,9.,11.,11.,11.,10.,3,6,2,4,12.
      103024    011     013     013
      103027    013     012     003
      103032    006     002     004
      103035    014
 4734 103036    000     005     000    DF6:    .BYTE   0,5,0,9.,11.,8.,8.,10.,3,6,2,4,12.
      103041    011     013     010
      103044    010     012     003
      103047    006     002     004
      103052    014
 4735 103053    000     005     011    DF7:    .BYTE   0,5,9.,0,0,11.,0,0,11.,10.,2,4
      103056    000     000     013
      103061    000     000     013
      103064    012     002     004
 4736 103067    000     005             DF8:    .BYTE   0,5
 4737 103071    000     001     001    DF9:    .BYTE   0,1,1,1,1
      103074    001     001
 4738 103076    000     000     000    DF10:   .BYTE   0,0,0,13.,13.
      103101    015     015
 4739 103103    000     005     000    DF11:   .BYTE   0,5,0,9.,0,0,0,0,0
      103106    011     000     000
      103111    000     000     000
 4740 103114    000     017             DF12:   .BYTE   0,15.
 4741 103116    000     005     000    DF13:   .BYTE   0,5,0,0,0,0,0
      103121    000     000     000
      103124    000
 4742 103125    000     005     000    DF14:   .BYTE   0,5,0,0,0,0,16.
      103130    000     000     000
      103133    020
 4743                                                   .EVEN
```

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                                                .SBTTL  ERROR MESSAGES (EM)
4752 103134 125 116 105 EM1:    .ASCIZ  /UNEXPECTED TRAP TO 170 (IIST) - PROGRAM CONTINUING:/
     103137 130 120 105
     103142 103 124 105
     103145 104 040 124
     103150 122 101 120
     103153 040 124 117
     103156 040 061 067
     103161 060 040 050
     103164 111 111 123
     103167 124 051 040
     103172 055 040 120
     103175 122 117 107
     103200 122 101 115
     103203 040 103 117
     103206 116 124 111
     103211 116 125 111
     103214 116 107 041
     103217 000
4753 103220 103 101 116 EM2:    .ASCIZ  /CAN'T SET 22 BIT MODE IN MMR3/
     103223 047 124 040
     103226 123 105 124
     103231 040 062 062
     103234 040 102 111
     103237 124 040 115
     103242 117 104 105
     103245 040 111 116
     103250 040 115 115
     103253 122 063 000
4754 103256 120 101 122 EM3:    .ASCIZ  /PARITY ERROR(S) IN BANK 0)/
     103261 111 124 131
     103264 040 105 122
     103267 122 117 122
     103272 050 123 051
     103275 040 111 116
     103300 040 102 101
     103303 116 113 040
     103306 060 051 000
4755 103311 116 117 116 EM4:    .ASCIZ  /NON-EXISTANT MEMORY (HOLES) IN BANK 0/
     103314 055 105 130
     103317 111 123 124
     103322 101 116 124
     103325 040 115 105
     103330 115 117 122
     103333 131 040 050
     103336 110 117 114
     103341 105 123 051
     103344 040 111 116
     103347 040 102 101
     103352 116 113 040
     103355 060 000
4756 103357 111 114 114 EM5:    .ASCIZ  /ILLEGAL OR RESERVED INSTRUCTION (TRAP TO 10)/
     103362 105 107 101
     103365 114 040 117
     103370 122 040 122
     103373 105 123 105
     103376 122 126 105
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                103401  104     040     11'
                103404  116     123     124
                103407  122     125     103
                103412  124     111     117
                103415  116     040     050
                103420  124     122     101
                103423  120     040     124
                103426  117     040     061
                103431  060     051     000
 4757           103434  125     116     105     EM6:    .ASCIZ  /UNEXPECTED TRAP TO 4/
                103437  130     120     105
                103442  103     124     105
                103445  104     040     124
                103450  122     101     120
                103453  040     124     117
                103456  040     064     000
 4758           103461  115     105     115     EM7:    .ASCIZ  /MEMORY MANAGEMENT (TRAP TO 250)/
                103464  117     122     131
                103467  040     115     101
                103472  116     101     107
                103475  105     115     105
                103500  116     124     040
                103503  050     124     122
                103506  101     120     040
                103511  124     117     040
                103514  062     065     060
                103517  051     000
 4759           103521  120     117     122     EM8:    .ASCIZ  /PORT CONTENTION NOT BALANCED/
                103524  124     040     103
                103527  117     116     124
                103532  105     116     124
                103535  111     117     116
                103540  040     116     117
                103543  124     040     102
                103546  101     114     101
                103551  116     103     105
                103554  104     000
 4760
 4761           103556  116     117     116     EM9:    .ASCIZ  /NON-EXISTANT CSR CAUSED INCORRECT ERROR TRAP/
                103561  055     105     130
                103564  111     123     124
                103567  101     116     124
                103572  040     103     123
                103575  122     040     103
                103600  101     125     123
                103603  105     104     040
                103606  111     116     103
                103611  117     122     122
                103614  105     103     124
                103617  040     105     122
                103622  122     117     122
                103625  040     124     122
                103630  101     120     000
 476?           103633  111     116     103     EM10:   .ASCIZ  /INCORRECT DATA FROM DEVICE REGISTER/
                103636  117     122     122
                103641  105     103     124
                103644  040     104     101
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                103647  124     101     040
                103652  106     122     117
                103655  115     040     104
                103660  105     126     111
                103663  103     105     040
                103666  122     105     107
                103671  111     123     124
                103674  105     122     000
   4763         103677  115     105     115     EM11:   .ASCIZ  /MEMORY DATA ERROR/
                103702  117     122     131
                103705  040     104     101
                103710  124     101     040
                103713  105     122     122
                103716  117     122     000
   4764         103721  104     105     124     EM12:   .ASCIZ  /DETAILED ERROR DUMP/
                103724  101     111     114
                103727  105     104     040
                103732  105     122     122
                103735  117     122     040
                103740  104     125     115
                103743  120     000
   4765         103745  115     111     123     EM13:   .ASCIZ  /MISSING EXPECTED SBE FLAG/
                103750  123     111     116
                103753  107     040     105
                103756  130     120     105
                103761  103     124     105
                103764  104     040     123
                103767  102     105     040
                103772  106     114     101
                103775  107     000
   4766         103777  127     122     111     EM14:   .ASCIZ  /WRITE BYTE FAILED TO CLEAR SBE FLAG/
                104002  124     105     040
                104005  102     131     124
                104010  105     040     106
                104013  101     111     114
                104016  105     104     040
                104021  124     117     040
                104024  103     114     105
                104027  101     122     040
                104032  123     102     105
                104035  040     106     114
                104040  101     107     000
   4767         104043  106     101     111     EM15:   .ASCIZ  /FAILED TO GET INTERRUPT WITH DBE FLAG/
                104046  114     105     104
                104051  040     124     117
                104054  040     107     105
                104057  124     040     111
                104062  116     124     105
                104065  122     122     125
                104070  120     124     040
                104073  127     111     124
                104076  110     040     104
                104101  102     105     040
                104104  106     114     101
                104107  107     000
   4768         104111  117     116     114     EM16:   .ASCIZ  /ONLY ONE DBE FLAG SET/
                104114  131     040     117
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                104117  116     105     040
                104122  104     102     105
                104125  040     106     114
                104130  101     107     040
                104133  123     105     124
                104136  000
 4769           104137  115     105     115     EM17:   .ASCIZ  /MEMORY DATA ERROR IN CHECK BITS/
                104142  117     122     131
                104145  040     104     101
                104150  124     101     040
                104153  105     122     122
                104156  117     122     040
                104161  111     116     040
                104164  103     110     105
                104167  103     113     040
                104172  102     111     124
                104175  123     000
 4770           104177  123     131     123     EM18:   .ASCIZ  /SYSTEM SIZE REGISTER LOW DOES NOT MATCH MEMORY/
                104202  124     105     115
                104205  040     123     111
                104210  132     105     040
                104213  122     105     107
                104216  111     123     124
                104221  105     122     040
                104224  114     117     127
                104227  040     104     117
                104232  105     123     040
                104235  116     117     124
                104240  040     115     101
                104243  124     103     110
                104246  040     115     105
                104251  115     117     122
                104254  131     000
 4771           104256  123     102     105     EM19:   .ASCIZ  /SBE OR DBE CAUSED PARITY TRAP WHEN INHIBITED/
                104261  040     117     122
                104264  040     104     102
                104267  105     040     103
                104272  101     125     123
                104275  105     104     040
                104300  120     101     122
                104303  111     124     131
                104306  040     124     122
                104311  101     120     040
                104314  127     110     105
                104317  116     040     111
                104322  116     110     111
                104325  102     111     124
                104330  105     104     000
 4772           104333  123     102     105     EM20:   .ASCIZ  /SBE OR DBE DID NOT CAUSE PARITY TRAP WHEN ENABLED/
                104336  040     117     122
                104341  040     104     102
                104344  105     040     104
                104347  111     104     040
                104352  116     117     124
                104355  040     103     101
                104360  125     123     105
                104363  040     120     101
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                104366  122     111     124
                104371  131     040     124
                104374  122     101     120
                104377  040     127     110
                104402  105     116     040
                104405  105     116     101
                104410  102     114     105
                104413  104     000
 4773           104415  123     102     105     EM21:   .ASCIZ  /SBE OR DBE ON MASTER TEST WORD/
                104420  040     117     122
                104423  040     104     102
                104426  105     040     117
                104431  116     040     115
                104434  101     123     124
                104437  105     122     040
                104442  124     105     123
                104445  124     040     127
                104450  117     122     104
                104453  000
 4774           104454  115     111     123     EM22:   .ASCIZ  /MISSING EXPECTED DBE/
                104457  123     111     116
                104462  107     040     105
                104465  130     120     105
                104470  103     124     105
                104473  104     040     104
                104476  102     105     000
 4775           104501  125     116     105     EM23:   .ASCIZ  /UNEXPECTED PARITY TRAP/
                104504  130     120     105
                104507  103     124     105
                104512  104     040     120
                104515  101     122     111
                104520  124     131     040
                104523  124     122     101
                104526  120     000
 4776           104530  122     105     103     EM24:   .ASCIZ  /RECEIVED DBE FLAG WHEN EXPECTING ONLY SBE FLAG/
                104533  105     111     126
                104536  105     104     040
                104541  104     102     105
                104544  040     106     114
                104547  101     107     040
                104552  127     110     105
                104555  116     040     105
                104560  130     120     105
                104563  103     124     111
                104566  116     107     040
                104571  117     116     114
                104574  131     040     123
                104577  102     105     040
                104602  106     114     101
                104605  107     000
 4777           104607  103     110     105     EM25:   .ASCIZ  /CHECK BIT DATA ERROR/
                104612  103     113     040
                104615  102     111     124
                104620  040     104     101
                104623  124     101     040
                104626  105     122     122
                104631  117     122     000
```

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 4778 104634  101  104  104  EM26:   .ASCIZ  /ADDRESS PARITY ERROR DID NOT CAUSE ABORT/
      104637  122  105  123
      104642  123  040  120
      104645  101  122  111
      104650  124  131  040
      104653  105  122  122
      104656  117  122  040
      104661  104  111  104
      104664  040  116  117
      104667  124  040  103
      104672  101  125  123
      104675  105  040  101
      104700  102  117  122
      104703  124  000
 4779 104705  115  113  061  EM27:   .ASCIZ  /MK11 PROTECTION POINTER FAILURE - DID NOT PROTECT BANK/
      104710  061  040  120
      104713  122  117  124
      104716  105  103  124
      104721  111  117  116
      104724  040  120  117
      104727  111  116  124
      104732  105  122  040
      104735  106  101  111
      104740  114  125  122
      104743  105  040  055
      104746  040  104  111
      104751  104  040  116
      104754  117  124  040
      104757  120  122  117
      104762  124  105  103
      104765  124  040  102
      104770  101  116  113
      104773  000
 4780 104774  103  120  125  EM28:   .ASCIZ  /CPU IDENTIFICATION FAILURE/
      104777  040  111  104
      105002  105  116  124
      105005  111  106  111
      105010  103  101  124
      105013  111  117  116
      105016  040  106  101
      105021  111  114  125
      105024  122  105  000
 4781 105027  103  117  122  EM29:   .ASCIZ  /CORRECTION FAILURE WITH ECC ENABLED ON FORCED SBE/
      105032  122  105  103
      105035  124  111  117
      105040  116  040  106
      105043  101  111  114
      105046  125  122  105
      105051  040  127  111
      105054  124  110  040
      105057  105  103  103
      105062  040  105  116
      105065  101  102  114
      105070  105  104  040
      105073  117  116  040
      105076  106  117  122
      105101  103  105  104
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                105104  040  123  102
                105107  105  000
 4782           105111  127  122  111  EM30:   .ASCII  /WRITE BYTE (MOVB) WITH ECC ENABLED FAILED TO CLEAR DATA AT/<CRLF>
                105114  124  105  040
                105117  102  131  124
                105122  105  040  050
                105125  115  117  126
                105130  102  051  040
                105133  127  111  124
                105136  110  040  105
                105141  103  103  040
                105144  105  116  101
                105147  102  114  105
                105152  104  040  106
                105155  101  111  114
                105160  105  104  040
                105163  124  117  040
                105166  103  114  105
                105171  101  122  040
                105174  104  101  124
                105177  101  040  101
                105202  124  200
 4783           105204  106  117  122          .ASCIZ  /FORCED SBE LOCATION/
                105207  103  105  104
                105212  040  123  102
                105215  105  040  114
                105220  117  103  101
                105223  124  111  117
                105226  116  000
 4784           105230  101  123  122  EM31:   .ASCIZ  /ASRB (R3)+ WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
                105233  102  040  050
                105236  122  063  051
                105241  053  040  127
                105244  111  124  110
                105247  040  105  103
                105252  103  040  105
                105255  116  101  102
                105260  114  105  104
                105263  040  103  110
                105266  101  116  107
                105271  105  104  040
                105274  104  101  124
                105277  101  040  101
                105302  124  040  106
                105305  117  122  103
                105310  105  104  040
                105313  104  102  105
                105316  040  114  117
                105321  103  101  124
                105324  111  117  116
                105327  000
 4785           105330  115  117  126  EM32:   .ASCIZ  /MOVB #360,(R2)+ WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
                105333  102  040  043
                105336  063  066  060
                105341  054  050  122
                105344  062  051  053
                105347  040  127  111
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                105352  124     110     040
                105355  105     103     103
                105360  040     105     116
                105363  101     102     114
                105366  105     104     040
                105371  103     110     101
                105374  116     107     105
                105377  104     040     104
                105402  101     124     101
                105405  040     101     124
                105410  040     106     117
                105413  122     103     105
                105416  104     040     104
                105421  102     105     040
                105424  114     117     103
                105427  101     124     111
                105432  117     116     000
 4786           105435  115     117     126  EM33:   .ASCIZ  /MOV #177400,(R1) WITH ECC ENABLED CHANGED DATA AT FORCED DBE LOCATION/
                105440  040     043     061
                105443  067     067     064
                105446  060     060     054
                105451  050     122     061
                105454  051     040     127
                105457  111     124     110
                105462  040     105     103
                105465  103     040     105
                105470  116     101     102
                105473  114     105     104
                105476  040     103     110
                105501  101     116     107
                105504  105     104     040
                105507  104     101     124
                105512  101     040     101
                105515  124     040     106
                105520  117     122     103
                105523  105     104     040
                105526  104     102     105
                105531  040     114     117
                105534  103     101     124
                105537  111     117     116
                105542  000
 4787           105543  123     102     105  EM34:   .ASCIZ  /SBE DETECTED BY MK11 BUT NOT ISOLATED BY PROGRAM/
                105546  040     104     105
                105551  124     105     103
                105554  124     105     104
                105557  040     102     131
                105562  040     115     113
                105565  061     061     040
                105570  102     125     124
                105573  040     116     117
                105576  124     040     111
                105601  123     117     114
                105604  101     124     105
                105607  104     040     102
                105612  131     040     120
                105615  122     117     107
                105620  122     101     115
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                105623  000
 4788 105624    125     116     105  EM35:   .ASCIZ  /UNEXPECTED CORRECTION WITH ECC DISABLE ON FORCED SBE/
      105627    130     120     105
      105632    103     124     105
      105635    104     040     103
      105640    117     122     122
      105643    105     103     124
      105646    111     117     116
      105651    040     127     111
      105654    124     110     040
      105657    105     103     103
      105662    040     104     111
      105665    123     101     102
      105670    114     105     040
      105673    117     116     040
      105676    106     117     122
      105701    103     105     104
      105704    040     123     102
      105707    105     000
 4789 105711    101     120     124  EM36:   .ASCIZ  /APT SIZE DISAGREES WITH PROGRAM SIZING/
      105714    040     123     111
      105717    132     105     040
      105722    104     111     123
      105725    101     107     122
      105730    105     105     123
      105733    040     127     111
      105736    124     110     040
      105741    120     122     117
      105744    107     122     101
      105747    115     040     123
      105752    111     132     111
      105755    116     107     000
 4790 105760    122     125     116  EM37:   .ASCIZ  /RUNNING CONTENTION INCREMEMT FAILURE/
      105763    116     111     116
      105766    107     040     103
      105771    117     116     124
      105774    105     116     124
      105777    111     117     116
      106002    040     111     116
      106005    103     122     105
      106010    115     105     115
      106013    124     040     106
      106016    101     111     114
      106021    125     122     105
      106024    000
 4791 106025    101     123     122  EM38:   .ASCIZ  /ASRB LOCK FAILURE (1 & ONLY 1 CPU SHOULD HAVE LOCKED) (LOCKED - ONES)/
      106030    102     040     114
      106033    117     103     113
      106036    040     106     101
      106041    111     114     125
      106044    122     105     040
      106047    050     061     040
      106052    046     040     117
      106055    116     114     131
      106060    040     061     040
      106063    103     120     125
      106066    040     123     110
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                106071  117     125     114
                106074  104     040     110
                106077  101     126     105
                106102  040     114     117
                106105  103     113     105
                106110  104     051     040
                106113  050     114     117
                106116  103     113     105
                106121  104     040     075
                106124  040     117     116
                106127  105     123     051
                106132  000
 4792           106133  101     123     122     EM39:   .ASCIZ  /ASRB LOCK BALANCE FAILURE (# OF LOCKS PER CPU BELOW)/
                106136  102     040     114
                106141  117     103     113
                106144  040     102     101
                106147  114     101     116
                106152  103     105     040
                106155  106     101     111
                106160  114     125     122
                106163  105     040     050
                106166  043     040     117
                106171  106     040     114
                106174  117     103     113
                106177  123     040     120
                106202  105     122     040
                106205  103     120     125
                106210  040     102     105
                106213  114     117     127
                106216  051     000
 4793           106220  102     122     101     EM40:   .ASCIZ  /BRANCH GOBBLE FAILED CONDITION CODES TEST/
                106223  116     103     110
                106226  040     107     117
                106231  102     102     114
                106234  105     040     106
                106237  101     111     114
                106242  105     104     040
                106245  103     117     116
                106250  104     111     124
                106253  111     117     116
                106256  040     103     117
                106261  104     105     123
                106264  040     124     105
                106267  123     124     000
 4794           106272  123     124     101     EM41:   .ASCIZ  /STALE DATA COULD NOT BE CREATED - CACHE FAILURE NOT MAIN MEMORY../
                106275  114     105     040
                106300  104     101     124
                106303  101     040     103
                106306  117     125     114
                106311  104     040     116
                106314  117     124     040
                106317  102     105     040
                106322  103     122     105
                106325  101     124     105
                106330  104     040     055
                106333  040     103     101
                106336  103     110     105
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                106341  040     106     101
                106344  111     114     125
                106347  122     105     040
                106352  116     117     124
                106355  040     115     101
                106360  111     116     040
                106363  115     105     115
                106366  117     122     131
                106371  041     041     000
 4795           106374  103     101     103     EM42:   .ASCIZ  /CACHE COULD NOT FLUSH STALE DATA - CACHE FAILURE NOT MAIN MEMORY  /
                106377  110     105     040
                106402  103     117     125
                106405  114     104     040
                106410  116     117     124
                106413  040     106     114
                106416  125     123     110
                106421  040     123     124
                106424  101     114     105
                106427  040     104     101
                106432  124     101     040
                106435  055     040     103
                106440  101     103     110
                106443  105     040     106
                106446  101     111     114
                106451  125     122     105
                106454  040     116     117
                106457  124     040     115
                106462  101     111     116
                106465  040     115     105
                106470  115     117     122
                106473  131     041     041
                106476  000
 4796           106477  123     114     101     EM43:   .ASCIZ  /SLAVE DID NOT RESPOND IN TIME - ABORTING MULTIPROCESSOR TESTS/
                106502  126     105     040
                106505  104     111     104
                106510  040     116     117
                106513  124     040     122
                106516  105     123     120
                106521  117     116     104
                106524  040     111     116
                106527  040     124     111
                106532  115     105     040
                106535  055     040     101
                106540  102     117     122
                106543  124     111     116
                106546  107     040     115
                106551  125     114     124
                106554  111     120     122
                106557  117     103     105
                106562  123     123     117
                106565  122     040     124
                106570  105     123     124
                106573  123     000
 4797           106575  111     111     123     EM44:   .ASCIZ  /LIST DID NOT RESPOND IN TIME - ABORTING MULTIPROCESSOR TESTS/
                106600  124     040     104
                106603  111     104     040
                106606  116     117     124
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                106611  040     122     105
                106614  123     120     117
                106617  116     104     040
                106622  111     116     040
                106625  124     111     115
                106630  105     040     055
                106633  040     101     102
                106636  117     122     124
                106641  111     116     107
                106644  040     115     125
                106647  114     124     111
                106652  120     122     117
                106655  103     105     123
                106660  123     117     122
                106663  040     124     105
                106666  123     124     123
                106671  000
4798            106672  116     117     124     EM45:   .ASCIZ  /NOT ENOUGH GOOD MEMORY FOR SLAVE - ABORTING MULTIPROCESSOR TESTS/
                106675  040     105     116
                106700  117     125     107
                106703  110     040     107
                106706  117     117     104
                106711  040     115     105
                106714  115     117     122
                106717  131     040     106
                106722  117     122     040
                106725  123     114     101
                106730  126     105     040
                106733  055     040     101
                106736  102     117     122
                106741  124     111     116
                106744  107     040     115
                106747  125     114     124
                106752  111     120     122
                106755  117     103     105
                106760  123     123     117
                106763  122     040     124
                106766  105     123     124
                106771  123     000
4799            106773  101     114     114     EM46:   .ASCIZ  /ALL CPUS NOT SHARING A MEMORY BANK (ACCESSABLE   ONES)/
                106776  040     103     120
                107001  125     123     040
                107004  116     117     124
                107007  040     123     110
                107012  101     122     111
                107015  116     107     040
                107020  101     040     115
                107023  105     115     117
                107026  122     131     040
                107031  102     101     116
                107034  113     040     050
                107037  101     103     103
                107042  105     123     123
                107045  101     102     114
                107050  105     040     075
                107053  040     117     116
                107056  105     123     051
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                107061  000
 4800           107062  103     123     122     EM47:   .ASCIZ  /CSR CONFIGURATION ERROR - PROBABLY CSR SWITCHES IN BOX ARE SET WRONG./
                107065  040     103     117
                107070  116     106     111
                107073  107     125     122
                107076  101     124     111
                107101  117     116     040
                107104  105     122     122
                107107  117     122     040
                107112  055     040     120
                107115  122     117     102
                107120  101     102     114
                107123  131     040     103
                107126  123     122     040
                107131  123     127     111
                107134  124     103     110
                107137  105     123     040
                107142  111     116     040
                107145  102     117     130
                107150  040     101     122
                107153  105     040     123
                107156  105     124     040
                107161  127     122     117
                107164  116     107     041
                107167  000
 4801           107170  101     120     124     EM48:   .ASCIZ  /APT EXPECTS DIFFERENT NUMBER OF CPU'S THAN DIAGNOSTIC CAN BOOT/
                107173  040     105     130
                107176  120     105     103
                107201  124     123     040
                107204  104     111     106
                107207  106     105     122
                107212  105     116     124
                107215  040     116     125
                107220  115     102     105
                107223  122     040     117
                107226  106     040     103
                107231  120     125     047
                107234  123     040     124
                107237  110     101     116
                107242  040     104     111
                107245  101     107     116
                107250  117     123     124
                107253  111     103     040
                107256  103     101     116
                107261  040     102     117
                107264  117     124     000
 4802           107267  120     117     122     EM49:   .ASCIZ  /PORT CONTENTION BALANCED WITH 3 CPU'S RAISED TO HIGH PRIORITY/
                107272  124     040     103
                107275  117     116     124
                107300  105     116     124
                107303  111     117     116
                107306  040     102     101
                107311  114     101     116
                107314  103     105     104
                107317  040     127     111
                107322  124     110     040
                107325  063     040     103
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        107330      120     125     047
        107333      123     040     122
        107336      101     111     123
        107341      105     104     040
        107344      124     117     040
        107347      110     111     107
        107352      110     040     120
        107355      122     111     117
        107360      122     111     124
        107363      131     000
 4803                                   .EVEN
```

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                                                .SBTTL  ERROR DATA HEADERS (DH)
 4806
 4807 107366  040  040  120  DH1:    .ASCIZ  /  PC   DEV ADD   GOOD    BAD/
      107371  103  040  040
      107374  040  104  105
      107377  126  040  101
      107402  104  104  040
      107405  040  040  107
      107410  117  117  104
      107413  040  040  040
      107416  040  102  101
      107421  104  000
 4808 107423  040  040  120  DH2:    .ASCIZ  /  PC   GD-CC BD-CC/
      107426  103  040  040
      107431  040  107  104
      107434  055  103  103
      107437  040  102  104
      107442  055  103  103
      107445  000
 4809 107446  040  040  120  DH3:    .ASCIZ  /  PC   1ST ADD  # OF ERRORS/
      107451  103  040  040
      107454  040  061  123
      107457  124  040  101
      107462  104  104  040
      107465  040  043  040
      107470  117  106  040
      107473  105  122  122
      107476  117  122  123
      107501  000
 4810 107502  040  040  120  DH4:    .ASCIZ  /  PC/
      107505  103  000
 4811 107507  040  040  120  DH5:    .ASCII  /  PC    CPUERR  MEMERR  HIADRS  LOADRS/
      107512  103  040  040
      107515  040  040  103
      107520  120  125  105
      107523  122  122  040
      107526  040  115  105
      107531  115  105  122
      107534  122  040  040
      107537  110  111  101
      107542  104  122  123
      107545  040  040  114
      107550  117  101  104
      107553  122  123
 4812 107555  040  040  040          .ASCIZ  /   MMR0    MMR1    MMR2    MMR3/
      107560  115  115  122
      107563  060  040  040
      107566  040  040  115
      107571  115  122  061
      107574  040  040  040
      107577  040  115  115
      107602  122  062  040
      107605  040  040  040
      107610  115  115  122
      107613  063  000
 4813 107615  040  040  120  DH6:    .ASCIZ  /  PC   APTCORE  MJSIZE  APTMOS  MKSIZE/
      107620  103  040  040
      107623  040  101  120
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                107626  124  103  117
                107631  122  105  040
                107634  040  115  112
                107637  123  111  132
                107642  105  040  040
                107645  101  120  124
                107650  115  117  123
                107653  040  040  115
                107656  113  123  111
                107661  132  105  000
 4814           107664  040  040  120  DH7:    .ASCII  /  PC    BANK  VADD     PADD     GOOD/
                107667  103  040  040
                107672  040  040  102
                107675  101  116  113
                107700  040  040  126
                107703  101  104  104
                107706  040  040  040
                107711  040  040  120
                107714  101  104  104
                107717  040  040  040
                107722  040  040  107
                107725  117  117  104
 4815           107730  040  040  040          .ASCIZ  /     BAD     XOR  MAR BOX MTYPE INT PAT ARRAY/
                107733  040  040  102
                107736  101  104  040
                107741  040  040  040
                107744  040  130  117
                107747  122  040  040
                107752  115  101  122
                107755  040  102  117
                107760  130  040  115
                107763  124  131  120
                107766  105  040  111
                107771  116  124  040
                107774  120  101  124
                107777  040  101  122
                110002  122  101  131
                110005  000
 4816           110006  104  105  126  DH8:    .ASCIZ  /DEV ADD   GOOD    BAD     GDSWITCH    BDSWITCH  NOTE: (OFF   1)/
                110011  040  101  104
                110014  104  040  040
                110017  040  107  117
                110022  117  104  040
                110025  040  040  040
                110030  102  101  104
                110033  040  040  040
                110036  040  040  107
                110041  104  123  127
                110044  111  124  103
                110047  110  040  040
                110052  040  040  102
                110055  104  123  127
                110060  111  124  103
                110063  110  040  040
                110066  116  117  124
                110071  105  072  040
                110074  050  117  106
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                110077  106     040     075
                110102  040     061     051
                110105  000
 4817           110106  040     040     120  DH9:    .ASCIZ  /  PC    CPUERR  MEMERR  CSRNUM/
                110111  103     040     040
                110114  040     040     103
                110117  120     125     105
                110122  122     122     040
                110125  040     115     105
                110130  115     105     122
                110133  122     040     040
                110136  103     123     122
                110141  116     125     115
                110144  000
 4818           110145  040     040     122  DH10:   .ASCIZ  /  R0      R1      R2      R3      R4      R5      SP      PSW/
                110150  060     040     040
                110153  040     040     040
                110156  040     122     061
                110161  040     040     040
                110164  040     040     040
                110167  122     062     040
                110172  040     040     040
                110175  040     040     122
                110200  063     040     040
                110203  040     040     040
                110206  040     122     064
                110211  040     040     040
                110214  040     040     040
                110217  122     065     040
                110222  040     040     040
                110225  040     040     123
                110230  120     040     040
                110233  040     040     040
                110236  040     120     123
                110241  127     000
 4819           110243  040     040     120  DH11:   .ASCIZ  /  PC      CSR     CSR+2/
                110246  103     040     040
                110251  040     040     040
                110254  040     103     123
                110257  122     040     040
                110262  040     040     103
                110265  123     122     053
                110270  062     000
 4820           110272  040     103     123  DH12:   .ASCIZ  / CSR   CSR+2/
                110275  122     040     040
                110300  040     103     123
                110303  122     053     062
                110306  000
 4821           110307  040     040     120  DH13:   .ASCII  /  PC    BANK  VADD     PADD    WROTE1  WROTE2/
                110312  103     040     040
                110315  040     040     102
                110320  101     116     113
                110323  040     040     126
                110326  101     104     104
                110331  040     040     040
                110334  040     040     120
                110337  101     104     104
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                110342  040     040     040
                110345  040     127     122
                110350  117     124     105
                110353  061     040     040
                110356  127     122     117
                110361  124     105     062
4822            110364  040     103     110             .ASCIZ  / CHKBITS    CSR     CSR+2/
                110367  113     102     111
                110372  124     123     040
                110375  040     040     040
                110400  103     123     122
                110403  040     040     040
                110406  040     103     123
                110411  122     053     062
                110414  000
4823            110415  115     105     115     DH14:   .ASCII  /MEMERR   MAINT  CONTRL  HIADRS  LOADRS  CPUERR/
                110420  105     122     122
                110423  040     040     040
                110426  115     101     111
                110433  116     124     040
                110434  040     103     117
                110437  116     124     122
                110442  114     040     040
                110445  110     111     101
                110450  104     122     123
                110453  040     040     114
                110456  117     101     104
                110461  122     123     040
                110464  040     103     120
                110467  125     105     122
                110472  122
4824            110473  040     040     040             .ASCIZ  /   MMR0    MMR1    MMR2    MMR3/
                110476  115     115     122
                110501  060     040     040
                110504  040     040     115
                110507  115     122     061
                110512  040     040     040
                110515  040     115     115
                110520  122     062     040
                110523  040     040     040
                110526  115     115     122
                110531  063     000
4825            110533  040     040     120     DH15:   .ASCII  /  PC    BANK    PADD    GD-WD1  GD-WD2  GD-CHK/
                110536  103     040     040
                110541  040     040     102
                110544  101     116     113
                110547  040     040     040
                110552  040     120     101
                110555  104     104     040
                110560  040     040     107
                110563  104     055     127
                110566  104     061     040
                110571  040     107     104
                110574  055     127     104
                110577  062     040     040
                110602  107     104     055
                110605  103     110     113
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 4826 110610  040  102  101          .ASCIZ  / BAD-WD1 BAD-WD2 BAD-CHK MAR INT PAT/
      110613  104  055  127
      110616  104  061  040
      110621  102  101  104
      110624  055  127  104
      110627  062  040  102
      110632  101  104  055
      110635  103  110  113
      110640  040  115  101
      110643  122  040  111
      110646  116  124  040
      110651  120  101  124
      110654  000
 4827 110655  040  040  120  DH16:  .ASCIZ  /  PC    BANK/
      110660  103  040  040
      110663  040  040  102
      110666  101  116  113
      110671  000
 4828 110672  040  040  120  DH17:  .ASCIZ  /  PC    BANK MASTER  SLAVE1  SLAVE2  SLAVE3/
      110675  103  040  040
      110700  040  040  102
      110703  101  116  113
      110706  040  115  101
      110711  123  124  105
      110714  122  040  040
      110717  123  114  101
      110722  126  105  061
      110725  040  040  123
      110730  114  101  126
      110733  105  062  040
      110736  040  123  114
      110741  101  126  105
      110744  063  000
 4829 110746  040  040  120  DH18:  .ASCIZ  /  PC    BANK  VADD     PADD     GOOD     BAD/
      110751  103  040  040
      110754  040  040  102
      110757  101  116  113
      110762  040  040  126
      110765  101  104  104
      110770  040  040  040
      110773  040  040  120
      110776  101  104  104
      111001  040  040  040
      111004  040  040  107
      111007  117  117  104
      111012  040  040  040
      111015  040  040  102
      111020  101  104  000
 4830 111023  040  040  120  DH19:  .ASCIZ  /  PC  ARRAY/
      111026  103  040  040
      111031  101  122  122
      111034  101  131  000
 4831 111037  040  040  120  DH20:  .ASCIZ  /  PC    SLAVE#/
      111042  103  040  040
      111045  040  040  123
      111050  114  101  126
      111053  105  043  000
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ERROR DATA HEADERS (DH)

```
 4832 111056  040  040  120  DH21:   .ASCIZ  /  PC/
      111061  103  000
 4833 111063  040  040  120  DH22:   .ASCIZ  /  PC    REAL#    APT#/
      111066  103  040  040
      111071  040  040  122
      111074  105  101  114
      111077  043  040  040
      111102  040  040  101
      111105  120  124  043
      111110  000
 4834 111111  040  040  120  DH23:   .ASCIZ  /  PC    BANK MASTER  SLAVE1  SLAVE2  SLAVE3  LOW-CPU/
      111114  103  040  040
      111117  040  040  102
      111122  101  116  113
      111125  040  115  101
      111130  123  124  105
      111133  122  040  040
      111136  123  114  101
      111141  126  105  061
      111144  040  040  123
      111147  114  101  126
      111152  105  062  040
      111155  040  123  114
      111160  101  126  105
      111163  063  040  040
      111166  114  117  127
      111171  055  103  120
      111174  125  000
 4835                      .EVEN
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4838                                        .SBTTL  MESSAGES
4839  111176  200  103  105  MSG000: .ASCIZ  <CRLF>/CEMKABO 1170 MAIN MEMORY DIAGNOSTIC <V14-00>/
      111201  115  113  101
      111204  102  060  040
      111207  061  061  067
      111212  060  040  115
      111215  101  111  116
      111220  040  115  105
      111223  115  117  122
      111226  131  040  104
      111231  111  101  107
      111234  116  117  123
      111237  124  111  103
      111242  040  074  126
      111245  061  064  055
      111250  060  060  076
      111253  000
4840  111254  200  040  040  MSG001: .ASCIZ  <CRLF>/                          MEMORY CONFIGURATION MAP/
      111257  040  040  040
      111262  040  040  040
      111265  040  040  040
      111270  040  040  040
      111273  040  040  040
      111276  040  040  040
      111301  040  040  040
      111304  040  115  105
      111307  115  117  122
      111312  131  040  103
      111315  117  116  106
      111320  111  107  125
      111323  122  101  124
      111326  111  117  116
      111331  040  115  101
      111334  120  000
4841  111336  200  040  040  MSG002: .ASCIZ  <CRLF>/                                16K WORD BANKS/
      111341  040  040  040
      111344  040  040  040
      111347  040  040  040
      111352  040  040  040
      111355  040  040  040
      111360  040  040  040
      111363  040  040  040
      111366  040  040  040
      111371  040  040  040
      111374  061  066  113
      111377  040  127  117
      111402  122  104  040
      111405  102  101  116
      111410  113  123  000
4842  111413  200  040  040  MSG003: .ASCII <CRLF>/                    1       2       3/
      111416  040  040  040
      111421  040  040  040
      111424  040  040  040
      111427  040  040  040
      111432  040  040  061
      111435  040  040  040
      111440  040  040  040
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                111443  040     062     040
                111446  040     040     040
                111451  040     040     040
                111454  063
 4843           111455  040     040     040             .ASCIZ  /       4       5       6       7 /
                111460  040     040     040
                111463  040     064     040
                111466  040     040     040
                111471  040     040     040
                111474  065     040     040
                111477  040     040     040
                111502  040     040     066
                111505  040     040     040
                111510  040     040     040
                111513  040     067     040
                111516  040     000
 4844           111520  200     040     040     MSG004: .ASCII <CRLF>/          01234567012345670123456701234567/
                111523  040     040     040
                111526  040     040     040
                111531  060     061     062
                111534  063     064     065
                111537  066     067     060
                111542  061     062     063
                111545  064     065     066
                111550  067     060     061
                111553  062     063     064
                111556  065     066     067
 4845           111561  060     061     062             .ASCIZ  /0123456701234567012345670123456701234567/
                111564  063     064     065
                111567  066     067     060
                111572  061     062     063
                111575  064     065     066
                111600  067     060     061
                111603  062     063     064
                111606  065     066     067
                111611  060     061     062
                111614  063     064     065
                111617  066     067     060
                111622  061     062     063
                111625  000
 4846           111626  200     105     122     MSG005: .ASCIZ  <CRLF>/ERRORS  /
                111631  122     117     122
                111634  123     040     040
                111637  000
 4847           111640  200     125     116     MSG006: .ASCIZ  <CRLF>/UNDEFINED TRAP INSTRUCTION/<32>
                111643  104     105     106
                111646  111     116     105
                111651  104     040     124
                111654  122     101     120
                111657  040     111     116
                111662  123     124     122
                111665  125     103     124
                111670  111     117     116
                111673  032     000
 4848           111675  200     111     116     MSG007: .ASCIZ  <CRLF>/INTRLV  /
                111700  124     122     114
                111703  126     040     040
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                111706  000
 4849           111707  200     103     120    MSG008: .ASCIZ  <CRLF>/CPU MAP / ;HEXADECIMAL(1=MASTER;2=SLAVE1;4=SLAVE2;8=SLAVE3)
                111712  125     040     115
                111715  101     120     040
                111720  000
 4850           111721  200     115     105    MSG009: .ASCIZ  <CRLF>/MEMTYPE /                ;MEMORY TYPE (0=MJ11;1=MK11)
                111724  115     124     131
                111727  120     105     040
                111732  000
 4851           111733  200     120     122    MSG010: .ASCIZ  <CRLF>/PROTECT /                ;MEMORY PROTECTED
                111736  117     124     105
                111741  103     124     040
                111744  000
 4852           111745  040     040     040    MSG011: .ASCIZ  /    0       1       2       3       4       5       6/
                111750  040     060     040
                111753  040     040     040
                111756  040     040     040
                111761  061     040     040
                111764  040     040     040
                111767  040     040     062
                111772  040     040     040
                111775  040     040     040
                112000  040     063     040
                112003  040     040     040
                112006  040     040     040
                112011  064     040     040
                112014  040     040     040
                112017  040     040     065
                112022  040     040     040
                112025  040     040     040
                112030  040     066     000
 4853           112033  064     065     066    MSG012: .ASCIZ  /456701234567012345670123456701234567012345670123456701234567/
                112036  067     060     061
                112041  062     063     064
                112044  065     066     067
                112047  060     061     062
                112052  063     064     065
                112055  066     067     060
                112060  061     062     063
                112063  064     065     066
                112066  067     060     061
                112071  062     063     064
                112074  065     066     067
                112077  060     061     062
                112102  063     064     065
                112105  066     067     060
                112110  061     062     063
                112113  064     065     066
                112116  067     060     061
                112121  062     063     064
                112124  065     066     067
                112127  000
 4854           112130  130     000             MSG013: .ASCIZ  /X/
 4855           112132  040     000             MSG014: .ASCIZ  / /             ;SPACE
 4856           112134  000     000             MSG015: .BYTE   0,0             ;FOR SINGLE ASCII CHARACTERS & TERMINATOR
 4857           112136  200     102     117    MSG016: .ASCIZ  <CRLF>/BOX      /
                112141  130     040     040
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                112144  040     040     040
                112147  000
 4858           112150  040     040     040     MSG017: .ASCIZ  /        /              ;8 SPACES
                112153  040     040     040
                112156  040     040     000
 4859           112161  040     040     000     MSG018: .ASCIZ  /  /                    ;2 SPACES
 4860           112164  040     040     040     MSG019: .ASCIZ  /   /                   ;3 SPACES
                112167  000
 4861           112170  200     106     111     MSG020: .ASCIZ  <CRLF>/FIELD SERVICE COMMAND MODE/
                112173  105     114     104
                112176  040     123     105
                112201  122     126     111
                112204  103     105     040
                112207  103     117     115
                112212  115     101     116
                112215  104     040     115
                112220  117     104     105
                112223  000
 4862           112224  200     103     117     MSG021: .ASCII  <CRLF>/COMMANDS AVAILABLE ARE:/
                112227  115     115     101
                112232  116     104     123
                112235  040     101     126
                112240  101     111     114
                112243  101     102     114
                112246  105     040     101
                112251  122     105     072
 4863           112254  200     060     040             .ASCII  <CRLF>/0 = EXIT FIELD SERVICE COMMANDS/
                112257  075     040     105
                112262  130     111     124
                112265  040     106     111
                112270  105     114     104
                112273  040     123     105
                112276  122     126     111
                112301  103     105     040
                112304  103     117     115
                112307  115     101     116
                112312  104     123
 4864           112314  200     061     040             .ASCII  <CRLF>/1 = READ CSR/
                112317  075     040     122
                112322  105     101     104
                112325  040     103     123
                112330  122
 4865           112331  200     062     040             .ASCII  <CRLF>/2 = LOAD CSR/
                112334  075     040     114
                112337  117     101     104
                112342  040     103     123
                112345  122
 4866           112346  200     063     040             .ASCII  <CRLF>/3 - EXAMINE MEMORY/
                112351  075     040     105
                112354  130     101     115
                112357  111     116     105
                112362  040     115     105
                112365  115     117     122
                112370  131
 4867           112371  200     064     040             .ASCII  <CRLF>/4   MODIFY MEMORY/
                112374  075     040     115
                112377  117     104     111
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                112402  106     131     040
                112405  115     105     115
                112410  117     122     131
4868            112413  200     065     040             .ASCII  <CRLF>/5 = SELECT BANK,MARGIN, & PATTERN/
                112416  075     040     123
                112421  105     114     105                     .
                112424  103     124     040
                112427  102     101     116
                112432  113     054     115
                112435  101     122     107
                112440  111     116     054
                112443  040     046     040
                112446  120     101     124
                112451  124     105     122
                112454  116
4869            112455  200     066     040             .ASCII  <CRLF>/6 = TYPE CONFIGURATION MAP/
                112460  075     040     124
                112463  131     120     105
                112466  040     103     117
                112471  116     106     111
                112474  107     125     122
                112477  101     124     111
                112502  117     116     040
                112505  113     101     120
4870            112510  200     067     040             .ASCII  <CRLF>'7 - BATTERY BACKUP - P/F TEST''
                112513  075     040     102
                112516  101     124     124
                11252*  105     122     131
                112524  040     102     101
                112527  103     113     125
                112532  120     040     055
                112535  040     120     057
                112540  106     040     124
                112543  105     123     124
4871            112546  200     070     040             .ASCII  <CRLF>/8 = SOB-A-LONG TEST/
                112551  075     040     123
                112554  117     102     055
                112557  101     055     114
                112562  117     116     107
                112565  040     124     105
                112570  123     124
4872            112572  200     071     040             .ASCII  <CRLF>/9 - SUPER TIGHT SCOPE LOOP/
                112575  075     040     123
                112600  125     120     105
                112603  122     040     124
                112606  111     107     110
                112611  124     040     123
                112614  103     117     120
                112617  105     040     114
                112622  117     117     120
4873            112625  200     061     060             .ASCII  <CRLF>/10= ERROR SUMMARY/
                112630  075     040     105
                112633  122     122     117
                112636  122     040     123
                112641  125     115     115
                112644  101     122     131
4874            112647  200     061     061             .ASCII  <CRLF>/11- REFRESH TEST/
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                112652  075     040     122
                112655  105     106     122
                112660  105     123     110
                112663  040     124     105
                112666  123     124
 4875           112670  200     061     062             .ASCII  <CRLF>/12= SET FILL COUNT/
                112673  075     040     123
                112676  105     124     040
                112701  106     111     114
                112704  114     040     103
                112707  117     125     116
                112712  124
 4876           112713  200     061     063             .ASCII  <CRLF>/13= ENTER KAMIKAZE MODE/
                112716  075     040     105
                112721  116     124     105
                112724  122     040     113
                112727  101     115     111
                112732  113     101     132
                112735  105     040     115
                112740  117     104     105
 4877           112743  200     061     064             .ASCII  <CRLF>/14= EXIT KAMIKAZE MODE/
                112746  075     040     105
                112751  130     111     124
                112754  040     113     101
                112757  115     111     113
                112762  101     132     105
                112765  040     115     117
                112770  104     105
 4878           112772  200     061     065             .ASCII  <CRLF>/15= TURN CACHE OFF/
                112775  075     040     124
                113000  125     122     116
                113003  040     103     101
                113006  103     110     105
                113011  040     117     106
                113014  106
 4879           113015  200     061     066             .ASCII  <CRLF>/16= TURN CACHE ON/
                113020  075     040     124
                113023  125     122     116
                113026  040     103     101
                113031  103     110     105
                113034  040     117     116
 4880           113037  200     061     067             .ASCII  <CRLF>/17= RUN ONLY MULTIPORT TESTS/
                113042  075     040     122
                113045  125     116     040
                113050  117     116     114
                113053  131     040     115
                113056  125     114     124
                113061  111     120     117
                113064  122     124     040
                113067  124     105     123
                113072  124     123
 4881           113074  200     061     070             .ASCII  <CRLF>/18  RESUME RUNNING BOTH SINGLE & MULTIPORT TESTS/
                113077  075     040     122
                113102  105     123     125
                113105  115     105     040
                113110  122     125     116
                113113  116     111     116
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                113116  107     040     102
                113121  117     124     110
                113124  040     123     111
                113127  116     107     114
                113132  105     040     046
                113135  040     115     125
                113140  114     124     111
                113143  120     117     122
                113146  124     040     124
                113151  105     123     124
                113154  123
 4882           113155  200     061     071             .ASCII  <CRLF>/19= TEST ONLY SELECTED BANKS/
                113160  075     040     124
                113163  105     123     124
                113166  040     117     116
                113171  114     131     040
                113174  123     105     114
                113177  105     103     124
                113202  105     104     040
                113205  102     101     116
                113210  113     123
 4883           113212  200     062     060             .ASCII  <CRLF>/20= RESUME TESTING ALL BANKS/
                113215  075     040     122
                113220  105     123     125
                113223  115     105     040
                113226  124     105     123
                113231  124     111     116
                113234  107     040     101
                113237  114     114     040
                113242  102     101     116
                113245  113     123
 4884           113247  015     012     000             .BYTE   15,12,0
 4885           113252  200     127     110     MSG022: .ASCIZ  <CRLF>/WHICH CSR(0-7)? /
                113255  111     103     110
                113260  040     103     123
                113263  122     050     060
                113266  055     067     051
                113271  077     040     000
 4886           113274  200     103     123     MSG023: .ASCIZ  <CRLF>/CSR - 1ST WORD? /
                113277  122     040     055
                113302  040     061     123
                113305  124     040     127
                113310  117     122     104
                113313  077     040     000
 4887           113316  200     103     123     MSG024: .ASCIZ  <CRLF>/CSR - 2ND WORD? /
                113321  122     040     055
                113324  040     062     116
                113327  104     040     127
                113332  117     122     104
                113335  077     040     000
 4888           113340  200     124     110     MSG025: .ASCIZ  <CRLF>/THIS CSR DOES NOT EXIST/
                113343  111     123     040
                113346  103     123     122
                113351  040     104     117
                113354  105     123     040
                113357  116     117     124
                113362  040     105     130
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                113365  111     123     124
                113370  000
 4889           113371  200     103     117     MSG026: .ASCIZ  <CRLF>/COMMAND:/
                113374  115     115     101
                113377  116     104     072
                113402  000
 4890           113403  200     117     114     MSG027: .ASCIZ  <CRLF>/OLD CSR WAS/
                113406  104     040     103
                113411  123     122     040
                113414  127     101     123
                113417  000
 4891           113420  200     103     123     MSG028: .ASCIZ  <CRLF>/CSR IS NOW/
                113423  122     040     111
                113426  123     040     116
                113431  117     127     000
 4892           113434  200     105     130     MSG029: .ASCIZ  <CRLF>/EXAMINE MEMORY/
                113437  101     115     111
                113442  116     105     040
                113445  115     105     115
                113450  117     122     131
                113453  000
 4893           113454  200     102     101     MSG030: .ASCIZ  <CRLF>/BANK(0-167)? /
                113457  116     113     050
                113462  060     055     061
                113465  066     067     051
                113470  077     040     000
 4894           113473  200     120     110     MSG031: .ASCIZ  <CRLF>/PHYSICAL ADDRESS(0-16777776)? /
                113476  131     123     111
                113501  103     101     114
                113504  040     101     104
                113507  104     122     105
                113512  123     123     050
                113515  060     055     061
                113520  066     067     067
                113523  067     067     067
                113526  066     051     077
                113531  040     000
 4895           113533  200     120     101     MSG032: .ASCIZ  <CRLF>/PARITY ABORT/<32>
                113536  122     111     124
                113541  131     040     101
                113544  102     117     122
                113547  124     032     000
 4896           113552  200     124     111     MSG033: .ASCIZ  <CRLF>/TIMEOUT TRAP/<32>
                113555  115     105     117
                113560  125     124     040
                113563  124     122     101
                113566  120     032     000
 4897           113571  200     102     131     MSG034: .ASCII  <CRLF>/BYPASSING CSR TESTS ON BOX /
                113574  120     101     123
                113577  123     111     116
                113602  107     040     103
                113605  123     122     040
                113610  124     105     123
                113613  124     123     040
                113616  117     116     040
                113621  102     117     130
                113624  040
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                                                MSGA34: .BYTE   0
4899 113626 040 103 117                                 .ASCII  / CONTROLLER /
     113631 116 124 122
     113634 117 114 114
     113637 105 122 040
                                                MSGB34: .BYTE   0
4901 113643 200 104 125                                 .ASCIZ  <CRLF>/DUE TO LACK OF SBE FREE LOCATIONS/<32>
     113646 105 040 124
     113651 117 040 114
     113654 101 103 113
     113657 040 117 106
     113662 040 123 102
     113665 105 040 106
     113670 122 105 105
     113673 040 114 117
     113676 103 101 124
     113701 111 117 116
     113704 123 032 000
4902 113707 121 126 000                         MSG035: .ASCIZ  /QV/
4903 113712 200 115 117                         MSG036: .ASCIZ  <CRLF>/MODIFY MEMORY/
     113715 104 111 106
     113720 131 040 115
     113723 105 115 117
     113726 122 131 000
4904 113731 200 117 114                         MSG037: .ASCIZ  <CRLF>/OLD DATA WAS /
     113734 104 040 104
     113737 101 124 101
     113742 040 127 101
     113745 123 040 000
4905 113750 200 104 101                         MSG038: .ASCIZ  <CRLF>/DATA IS NOW /
     113753 124 101 040
     113756 111 123 040
     113761 116 117 127
     113764 040 000
4906 113766 200 111 116                         MSG039: .ASCIZ  <CRLF>/INPUT NEW DATA? /
     113771 120 125 124
     113774 040 116 105
     113777 127 040 104
     114002 101 124 101
     114005 077 040 000
4907 114010 200 123 105                         MSG040: .ASCIZ  <CRLF>/SELECT BANK, MARGIN, & PATTERN TEST/
     114013 114 105 103
     114016 124 040 102
     114021 101 116 113
     114024 054 040 115
     114027 101 122 107
     114032 111 116 054
     114035 040 046 040
     114040 120 101 124
     114043 124 105 122
     114046 116 040 124
     114051 105 123 124
     114054 000
4908 114055 200 102 101                         MSG041: .ASCIZ  <CRLF>/BANK NOT ACCESSABLE/
     114060 116 113 040
     114063 116 117 124
     114066 040 101 103
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                114071  103     105     123
                114074  123     101     102
                114077  114     105     000
4909            114102  200     120     101     MSG042: .ASCIZ  <CRLF>/PATTERN(0-37)? /
                114105  124     124     105
                114110  122     116     050
                114113  060     055     063
                114116  067     051     077
                114121  040     000
4910            114123  200     120     101     MSG043: .ASCIZ  <CRLF>/PATTERN 0 DATA IS? /
                114126  124     124     105
                114131  122     116     040
                114134  060     040     104
                114137  101     124     101
                114142  040     111     123
                114145  077     040     000
4911            114150  200     115     101     MSG044: .ASCIZ  <CRLF>/MARGIN(0,2,3,4,5)? /
                114153  122     107     111
                114156  116     050     060
                114161  054     062     054
                114164  063     054     064
                114167  054     065     051
                114172  077     040     000
4912            114175  200     115     101     MSG045: .ASCIZ  <CRLF>/MARGINS INHIBITED BY SW11!/
                114200  122     107     111
                114203  116     123     040
                114206  111     116     110
                114211  111     102     111
                114214  124     105     104
                114217  040     102     131
                114222  040     123     127
                114225  061     061     041
                114230  000
4913            114231  200     124     117     MSG046: .ASCIZ  <CRLF>/TO ESCAPE TYPE ANY KEY/<CRLF><12><12>
                114234  040     105     123
                114237  103     101     120
                114242  105     040     124
                114245  131     120     105
                114250  040     101     116
                114253  131     040     113
                114256  105     131     200
                114261  012     012     000
4914            114264  200     124     105     MSG047: .ASCIZ  <CRLF>/TEST COMPLETE/
                114267  123     124     040
                114272  103     117     115
                114275  120     114     105
                114300  124     105     000
4915            114303  040     116     117     MSG048: .ASCIZ  / NOT AVAILABLE NOW - TRY LATER./
                114306  124     040     101
                114311  126     101     111
                114314  114     101     102
                114317  114     105     040
                114322  116     117     127
                114325  040     055     040
                114330  124     122     131
                114333  040     114     101
                114336  124     105     122
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                114341  041     000
 4916           114343  200     102     101     MSG049: .ASCIZ  <CRLF>/BANK REQUIRES RELOCATION/
                114346  116     113     040
                114351  122     105     121
                114354  125     111     122
                114357  105     123     040
                114362  122     105     114
                114365  117     103     101
                114370  124     111     117
                114373  116     000
 4917           114375  200     102     101     MSG050: .ASCII  <CRLF>/BATTERY BACKUP TEST/
                114400  124     124     105
                114403  122     131     040
                114406  102     101     103
                114411  113     125     120
                114414  040     124     105
                114417  123     124
 4918           114421  200     127     122             .ASCIZ  <CRLF>/WRITING & CHECKING ADDRESS PATTERN AS BACKGROUND/
                114424  111     124     111
                114427  116     107     040
                114432  046     040     103
                114435  110     105     103
                114440  113     111     116
                114443  107     040     101
                114446  104     104     122
                114451  105     123     123
                114454  040     120     101
                114457  124     124     105
                114462  122     116     040
                114465  101     123     040
                114470  102     101     103
                114473  113     107     122
                114476  117     125     116
                114501  104     000
 4919           114503  200     120     117     MSG051: .ASCIZ  <CRLF>/POWER RECOVERY/
                114506  127     105     122
                114511  040     122     105
                114514  103     117     126
                114517  105     122     131
                114522  000
 4920           114523  200     122     105     MSG052: .ASCIZ  <CRLF>/REMOVE SYSTEM POWER FOR/
                114526  115     117     126
                114531  105     040     123
                114534  131     123     124
                114537  105     115     040
                114542  120     117     127
                114545  105     122     040
                114550  106     117     122
                114553  000
 4921           114554  040     123     105     MSG053: .ASCIZ  / SECONDS MAX./
                114557  103     117     116
                114562  104     123     040
                114565  115     101     130
                114570  041     000
 4922           114572  200     116     117     MSG054: .ASCIZ  <CRLF>/NOW STARTING READ TEST OF MEMORY BANKS/
                114575  127     040     123
                114600  124     101     122
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        114603  124  111  116
        114606  107  040  122
        114611  105  101  104
        114614  040  124  105
        114617  123  124  040
        114622  117  106  040
        114625  115  105  115
        114630  117  122  131
        114633  040  102  101
        114636  116  113  123
        114641  000
  4923  114642  200  123  117  MSG055: .ASCIZ  <CRLF>/SOB-A-LONG TEST/
        114645  102  055  101
        114650  055  114  117
        114653  116  107  040
        114656  124  105  123
        114661  124  000
  4924  114663  200  102  105  MSG056: .ASCIZ  <CRLF>/BELL = EACH PASS COMPLETE/
        114666  114  114  040
        114671  075  040  105
        114674  101  103  110
        114677  040  120  101
        114702  123  123  040
        114705  103  117  115
        114710  120  114  105
        114713  124  105  000
  4925  114716  040  077  040  MSG057: .ASCIZ  / ? /
        114721  000
  4926  114722  200  040  040  MSG058: .ASCIZ  <CRLF>/  CSR    CSR+2    CSR    CSR+2 .../
        114725  103  123  122
        114730  040  040  040
        114733  040  103  123
        114736  122  053  062
        114741  040  040  040
        114744  040  103  123
        114747  122  040  040
        114752  040  040  103
        114755  123  122  053
        114760  062  040  056
        114763  056  056  000
  4927  114766  200  123  125  MSG059: .ASCIZ  <CRLF>/SUPER TIGHT SCOPE LOOP/
        114771  120  105  122
        114774  040  124  111
        114777  107  110  124
        115002  040  123  103
        115005  117  120  105
        115010  040  114  117
        115013  117  120  000
  4928  115016  200  123  127  MSG060: .ASCIZ  <CRLF>/SWREG ---> MEM, MEM ---> DISPLAY/
        115021  122  105  107
        115024  040  055  055
        115027  055  076  040
        115032  115  105  115
        115035  054  040  115
        115040  105  115  040
        115043  055  055  055
        115046  076  040  104
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        115051  111     123     120
        115054  114     101     131
        115057  000
  4929  115060  077     077     077     MSG061: .ASCIZ  /??????/
        115063  077     077     077
        115066  000
  4930  115067  111     116     120     MSG062: .ASCIZ  /INPUT MUST BE A/
        115072  125     124     040
        115075  115     125     123
        115100  124     040     102
        115103  105     040     101
        115106  000
  4931  115107  116     040     117     MSG063: .ASCIZ  /N OCTAL /
        115112  103     124     101
        115115  114     040     000
  4932  115120  116     125     115     MSG064: .ASCIZ  /NUMBER/<CRLF>
        115123  102     105     122
        115126  200     000
  4933  115130  040     104     105     MSG065: .ASCIZ  / DECIMAL /
        115133  103     111     115
        115136  101     114     040
        115141  000
  4934  115142  200     105     122     MSG066: .ASCIZ  <CRLF>/ERROR COUNT EXCEEDED 20 - ABORTING FOR XXDP CHAIN/
        115145  122     117     122
        115150  040     103     117
        115153  125     116     124
        115156  040     105     130
        115161  103     105     105
        115164  104     105     104
        115167  040     062     060
        115172  040     055     040
        115175  101     102     117
        115200  122     124     111
        115203  116     107     040
        115206  106     117     122
        115211  040     130     130
        115214  104     120     040
        115217  103     110     101
        115222  111     116     000
  4935  115225  106     101     124     MSG067: .ASCIZ  /FATAL /
        115230  101     114     040
        115233  000
  4936  115234  115     112     061     MSG068: .ASCIZ  /MJ11/
        115237  061     000
  4937  115241  115     113     061     MSG069: .ASCIZ  /MK11/
        115244  061     000
  4938  115246  113     040     127     MSG070: .ASCIZ  /K WORDS OF MEMORY/<CRLF>
        115251  117     122     104
        115254  123     040     117
        115257  106     040     115
        115262  105     115     117
        115265  122     131     200
        115270  000
  4939  115271  113     040     117     MSG071: .ASCIZ  /K OF MJ11/<CRLF>
        115274  106     040     115
        115277  112     061     061
        115302  200     000
```

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4940 115304   113   040   117  MSG072: .ASCIZ  /K OF MK11/<CRLF>
     115307   106   040   115
     115312   113   061   061
     115315   200   000
4941 115317   200   122   105  MSG073: .ASCIZ  <CRLF>/REFRESH TEST/
     115322   106   122   105
     115325   123   110   040
     115330   124   105   123
     115333   124   000
4942                                   .EVEN   ;THIS STAYS WITH MSG074
4943 115336   077   077   000  MSG074: .ASCIZ  /??/
4944 115341   200   122   105  MSG075: .ASCIZ  <CRLF>/RELOCATION NOT POSSIBLE/<32>
     115344   114   117   103
     115347   101   124   111
     115352   117   116   040
     115355   116   117   124
     115360   040   120   117
     115363   123   123   111
     115366   102   114   105
     115371   032   000
4945 115373   200   040   040  MSG076: .ASCIZ  <CRLF>/  BANK  ERRORS/<CRLF>
     115376   102   101   116
     115401   113   040   040
     115404   105   122   122
     115407   117   122   123
     115412   200   000
4946 115414   200   105   116  MSG077: .ASCIZ  <CRLF>/END PASS #/
     115417   104   040   120
     115422   101   123   123
     115425   040   043   000
4947 115430   200   127   101  MSG078: .ASCIZ  <CRLF>/WARNING.  ECC IS DISABLED ON BOX /<32>
     115433   122   116   111
     115436   116   107   041
     115441   040   040   105
     115444   103   103   040
     115447   111   123   040
     115452   104   111   123
     115455   101   102   114
     115460   105   104   040
     115463   117   116   040
     115466   102   117   130
     115471   040   032   000
4948 115474   040   105   122  MSG079: .ASCIZ  / ERROR(S) DETECTED/<CRLF>
     115477   122   117   122
     115502   050   123   051
     115505   040   104   105
     115510   124   105   103
     115513   124   105   104
     115516   200   000
4949 115520   200   105   116  MSG080: .ASCIZ  <CRLF>/ENTER # OF SLAVE CPU'S (0-3)? /
     115523   124   105   122
     115526   040   043   040
     115531   117   106   040
     115534   123   114   101
     115537   126   105   040
     115542   103   120   125
     115545   047   123   040
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                115550  050     060     053
                115553  063     051     077
                115556  040     000
 4950           115560  200     123     124     MSG081: .ASCIZ  <CRLF>/START SLAVE #/
                115563  101     122     124
                115566  040     123     114
                115571  101     126     105
                115574  040     043     000
 4951           115577  040     101     124     MSG082: .ASCIZ  / AT ADDRESS 200/
                115602  040     101     104
                115605  104     122     105
                115610  123     123     040
                115613  062     060     060
                115616  000
 4952           115617  200     120     122     MSG084: .ASCIZ  <CRLF>/PROCEEDING AS A SINGLE PORT TEST/
                115622  117     103     105
                115625  105     104     111
                115630  116     107     040
                115633  101     123     040
                115636  101     040     123
                115641  111     116     107
                115644  114     105     040
                115647  120     117     122
                115652  124     040     124
                115655  105     123     124
                115660  000
 4953           115661  200     106     111     MSG085: .ASCIZ  <CRLF>/FILL COUNT(OCTAL)? /
                115664  114     114     040
                115667  103     117     125
                115672  116     124     050
                115675  117     103     124
                115700  101     114     051
                115703  077     040     000
 4954           115706  200     115     125     MSG086: .ASCII  <CRLF>/MULTIPORT DIRECTORY/
                115711  114     124     111
                115714  120     117     122
                115717  124     040     104
                115722  111     122     105
                115725  103     124     117
                115730  122     131
 4955           115732  200     115     101             .ASCIZ  <CRLF>/MASTER = /
                115735  123     124     105
                115740  122     040     075
                115743  040     000
 4956           115745  200     123     114     MSG087: .ASCII  <CRLF>/SLAVE/
                115750  101     126     105
 4957           115753  060                     MSGA87: .BYTE   '0
 4958           115754  040     075     040             .ASCIZ  / = /
                115757  000
 4959           115760  200     113     105     MSG088: .ASCIZ  <CRLF>/KERNEL STACK/
                115763  122     116     105
                115766  114     040     123             .
                115771  124     101     103
                115774  113     000
 4960           115776  200     123     125     MSG089: .ASCIZ  <CRLF>/SUPERVISOR STACK/
                116001  120     105     122
                116004  126     111     123
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                116007  117  122  040
                116012  123  124  101
                116015  103  113  000
 4961           116020  200  125  123  MSG090: .ASCIZ  <CRLF>/USER STACK/
                116023  105  122  040
                116026  123  124  101
                116031  103  113  000
 4962           116034  040  111  123  MSG091: .ASCIZ  / IS EMPTY/
                116037  040  105  115
                116042  120  124  131
                116045  000
 4963           116046  122  105  114  MSG092: .ASCIZ  /RELOCATED  /
                116051  117  103  101
                116054  124  105  104
                116057  040  040  000
 4964           116062  102  101  116  MSG093: .ASCIZ  /BANK -/
                116065  113  075  000
 4965           116070  040  040  115  MSG094: .ASCIZ  /  MAR=/
                116073  101  122  075
                116076  000
 4966           116077  040  040  120  MSG095: .ASCIZ  /  PAT=/
                116102  101  124  075
                116105  000
 4967           116106  200  114  117  MSG096: .ASCIZ  <CRLF>/LOADERS BEING DESTROYED/
                116111  101  104  105
                116114  122  123  040
                116117  102  105  111
                116122  116  107  040
                116125  104  105  123
                116130  124  122  117
                116133  131  105  104
                116136  000
 4968           116137  200  127  101  MSG097: .ASCIZ  <CRLF>/WARNING.  ILLEGAL INTERLEAVE SELECTED (FIELD SERVICE ONLY)/<32>
                116142  122  116  111
                116145  116  107  041
                116150  040  040  111
                116153  114  114  105
                116156  107  101  114
                116161  040  111  116
                116164  124  105  122
                116167  114  105  101
                116172  126  105  040
                116175  123  105  114
                116200  105  103  124
                116203  105  104  040
                116206  050  106  111
                116211  105  114  104
                116214  040  123  105
                116217  122  126  111
                116222  103  105  040
                116225  117  116  114
                116230  131  051  032
                116233  000
 4969           116234  200  123  114  MSG098: .ASCII  <CRLF>/SLAVE/
                116237  101  126  105
 4970           116242  000               MSGA98: .BYTE   0
 4971           116243  076  000                .ASCIZ  />/
```

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 4972 116245  200  115  101  MSG099: .ASCIZ  <CRLF>/MASTER>/
      116250  123  124  105
      116253  122  076  000
 4973 116256  200  115  125  MSG100: .ASCIZ  <CRLF>/MULTIPROCESSOR TEST #/
      116261  114  124  111
      116264  120  122  117
      116267  103  105  123
      116272  123  117  122
      116275  040  124  105
      116300  123  124  040
      116303  043  000
 4974 116305  200  105  116  MSG101: .ASCIZ  <CRLF>/ENTERING KAMIKAZE MODE/
      116310  124  105  122
      116313  111  116  107
      116316  040  113  101
      116321  115  111  113
      116324  101  132  105
      116327  040  115  117
      116332  104  105  000
 4975 116335  200  114  105  MSG102: .ASCIZ  <CRLF>/LEAVING KAMIKAZE MODE/
      116340  101  126  111
      116343  116  107  040
      116346  113  101  115
      116351  111  113  101
      116354  132  105  040
      116357  115  117  104
      116362  105  000
 4976 116364  200  114  105  MSG103: .ASCIZ  <CRLF>/LEAVING FIELD SERVICE MODE/<CRLF>
      116367  101  126  111
      116372  116  107  040
      116375  106  111  105
      116400  114  104  040
      116403  123  105  122
      116406  126  111  103
      116411  105  040  115
      116414  117  104  105
      116417  200  000
 4977 116421  032  000       MSG104: .BYTE   32,0                    ;CONTROL Z
 4978 116423  200  105  116  MSG105: .ASCIZ  <CRLF>/ENTER BANKS IN OCTAL - USE NUMBER OUTSIDE RANGE TO TERMINATE (177)/
      116426  124  105  122
      116431  040  102  101
      116434  116  113  123
      116437  040  111  116
      116442  040  117  103
      116445  124  101  114
      116450  040  055  040
      116453  125  123  105
      116456  040  116  125
      116461  115  102  105
      116464  122  040  117
      116467  125  124  123
      116472  111  104  105
      116475  040  122  101
      116500  116  107  105
      116503  040  124  117
      116506  040  124  105
      116511  122  115  111
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                116514  116  101  124
                116517  105  040  050
                116522  061  067  067
                116525  051  000
 4979           116527  200  103  101  MSG106: .ASCIZ  <CRLF>/CACHE IS OFF/
                116532  103  110  105
                116535  040  111  123
                116540  040  117  106
                116543  106  000
 4980           116545  200  103  101  MSG107: .ASCIZ  <CRLF>/CACHE IS ON (EXCEPT DURING ACTUAL PATTERNS)/
                116550  103  110  105
                116553  040  111  123
                116556  040  117  116
                116561  040  050  105
                116564  130  103  105
                116567  120  124  040
                116572  104  125  122
                116575  111  116  107
                116600  040  101  103
                116603  124  125  101
                116606  114  040  120
                116611  101  124  124
                116614  105  122  116
                116617  123  051  000
 4981           116622  200  117  116  MSG108: .ASCIZ  <CRLF>/ONLY MULTIPORT TESTS WILL BE RUN/
                116625  114  131  040
                116630  115  125  114
                116633  124  111  120
                116636  117  122  124
                116641  040  124  105
                116644  123  124  123
                116647  040  127  111
                116652  114  114  040
                116655  102  105  040
                116660  122  125  116
                116663  000
 4982           116664  200  102  117  MSG109: .ASCIZ  <CRLF>/BOTH SINGLE & MULTIPORT TESTS WILL BE RUN/
                116667  124  110  040
                116672  123  111  116
                116675  107  114  105
                116700  040  046  040
                116703  115  125  114
                116706  124  111  120
                116711  117  122  124
                116714  040  124  105
                116717  123  124  123
                116722  040  127  111
                116725  114  114  040
                116730  102  105  040
                116733  122  125  116
                116736  000
 4983           116737  200  117  116  MSG110: .ASCIZ  <CRLF>/ONLY SELECTED BANKS WILL BE TESTED/
                116742  114  131  040
                116745  123  105  114
                116750  105  103  124
                116753  105  104  040
                116756  102  101  116
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                116761      113     123     040
                116764      127     111     114
                116767      114     040     102
                116772      105     040     124
                116775      105     123     124
                117000      105     104     000
 4984           117003      200     101     114  MSG111: .ASCIZ  <CRLF>/ALL BANKS WILL BE TESTED/
                117006      114     040     102
                117011      101     116     113
                117014      123     040     127
                117017      111     114     114
                117022      040     102     105
                117025      040     124     105
                117030      123     124     105
                117033      104     000
 4985           117035      200     120     122  MSG112: .ASCIZ  <CRLF>/PROGRAM HALTING BECAUSE OF SWITCH #8/
                117040      117     107     122
                117043      101     115     040
                117046      110     101     114
                117051      124     111     116
                117054      107     040     102
                117057      105     103     101
                117062      125     123     105
                117065      040     117     106
                117070      040     123     127
                117073      111     124     103
                117076      110     040     043
                117101      070     000
 4986           117103      040     115     101  MSG113: .ASCIZ  / MASTER/
                117106      123     124     105
                117111      122     000
 4987           117113      040     123     114  MSG114: .ASCIZ  / SLAVE1/
                117116      101     126     105
                117121      061     000
 4988           117123      040     123     114  MSG115: .ASCIZ  / SLAVE2/
                117126      101     126     105
                117131      062     000
 4989           117133      040     123     114  MSG116: .ASCIZ  / SLAVE3/
                117136      101     126     105
                117141      063     000
 4990
 4996           117144                           .EVEN
 4997           117144                           $$END
 4998           117144  000406                END:
 5003           117144  002004                .PRINT  60000-SUPLIMIT  ;SUPERVISOR ADDRESSES LEFT
 5008           117144  020634                .PRINT  100000-SLAVEND  ;ADDRESSES LEFT IN SLAVE UNIQUE CODE
 5012                   000200                .PRINT  140000-END      ;ADDRESSES LEFT IN 24K
                                              .END START3
```

SYMBOL TABLE

SEQ 1073

```
ABORTF  002142        BIT4   = 000020        B144    062364        B36     024446        CMD20A  050576
ACFLAG  002124        BIT5   = 000040        B145    062450        B37     024452        CMD5A   045456
ACK     002672        BIT6   = 000100        B146    062572        B4      010550        CMD5B   045666
ACTFLA  002442        BIT7   = 000200        B147    062630        B40     024616        CMD5C   046052
ADDPAR  014570        BIT8   = 000400        B15     013004        B41     024624        CMD7A   046336
ADDRES  002040        BIT9   = 001000        B150    062632        B42     025034        CMD8A   046550
ADD..0  071152        BLOCK1   043710        B151    062674        B43     033412        CMD8B   046740
ADD..1  071162        BLOCK2   043730        B152    063032        B44     033450        CMD8C   047014
ADD..2  071202        BLOCK3   043744        B153    063070        B45     033464        CMD9A   047240
ADD..3  071232        BMFLAG   002136        B154    063120        B46     033604        CMD9B   047456
ADD..4  071262        BOOT     043416        B155    063170        B47     033764        CMD9C   047464
ADD..5  071264        BOOTLO=  000012        B156    063172        B5      010554        CMD9LO  047444
ADD..6  071304        BOOT1    043460        B157    063330        B50     034006        CONFGE  002576
ADD..7  071334        BRGOBB   035112        B16     013014        B51     040014        CONFGT  006666
ALLCPU  002510        B0       005500        B160    063404        B52     040020        CONFG1  006304
APTCOR  002522        B1       007742        B161    063410        B53     040160        CONFG3  006520
APTDOW  043640        B10      011352        B162    063472        B54     040164        CONFG5  006712
APTFLA  002444        B100     053774        B163    063522        B55     040450        CONFIE  004336
APTHAN  015050        B101     054102        B164    063602        B56     040454        CONFIG  003016
APTHLT  043706        B102     054146        B165    063604        B57     041144        CONFSP  006754
APTMOS  002524        B103     054226        B166    063754        B6      010642        CONTFL  002332
APTSIZ  002544        B104     054234        B167    064016        B60     041152        CONTP   073112
ASRBAL= 000110        B105     054256        B17     013016        B61     041302        CONTRL= 177746
A3     = 000002        B106     054370        B170    064052        B62     041306        CONTS   073544
BACKGN  035344        B107     054416        B171    064122        B63     042530        CONTS1  073052
BAD     002056        B11      011360        B172    064124        B64     046374        CONTS2  073546
BADCSR  002000        B110     054472        B173    064246        B65     046744        CONTT   073404
BADPC   002026        B111     054474        B174    064260        B66     047612        COREHI  043300
BADPSW  002036        B112     055374        B175    064316        B67     050170        COUNT   002462
BADSP   002032        B113     055400        B176    064372        B7      010732        CPUBIT  002114
BADSTA  036770        B114     055700        B177    064512        B70     050512        CPUERR= 177766
BADXOR  002064        B115     055706        B2      010312        B71     050512        CPUID   011656
BAD2    002060        B116     057452        B20     013124        B72     050600        CR     = 000015
BAD3    002062        B117     057474        B200    070344        B73     050752        CRLF   = 000200
BAFPAF  015204        B12      012140        B201    070436        B74     053016        CSR     002144
BAFPAR  015320        B120     057622        B202    070736        B75     053024        CSRCAS  020114
BAKPAT  002762        B121     057756        B203    070740        B76     053660        CSRFB   002214
BALANC- 000155        B122     060072        B204    071610        B77     053710        CSRFBA  002410
BANK    002106        B123     060244        B205    071614        CACHK   002700        CSRFIR  002336
BANKIN  002110        B124     060256        B206    071730        CACHOF= 104424        CSRINC  002414
BANKMO  042072        B125     060264        B207    072012        CACHON= 104423        CSRIND  002416
BANKOK  042730        B126     060514        B21     013220        CACHVE= 000114        CSRLB   002234
BAWPAF  015434        B127     060754        B210    072076        CBCSR  = 104474        CSRLBA  002412
BAWPAR  015572        B13      012144        B211    072174        CB1CSR= 104475        CSRLDO  002420
BDSWIT  002500        B130     061340        B22     013270        CHECK   002404        CSRNO   002256
BEGIN   005752        B131     061352        B23     013632        CHKDIS= 104504        CSROUD  002417
BGTEST  035110        B132     061412        B24     014144        CHKGEN  040540        CSROUT  040442
BIT0   = 000001        B133     061520        B25     014512        CHKTAB  040640        CSRREL  002254
BIT1   = 000002        B134     061572        B26     015114        CHK1DI= 104505        CSRSTU= 000031
BIT10  = 002000        B135     061724        B27     016722        CKEND   073316        CSR0    002154
BIT11  = 004000        B136     061736        B3      010316        CKSWR  = 104410        CSR2    002174
BIT12  = 010000        B137     061774        B30     016744        CLRCSR= 104502        DATBUF  002340
BIT13  = 020000        B14      012556        B31     016750        CLR1CS= 104503        DBEMSK  002354
BIT14  = 040000        B140     062102        B32     016762        CMD11A  047774        DDISP  = 177570
BIT15  = 100000        B141     062154        B33     017044        CMD11B  050164        DECMAR  043152
BIT2   = 000004        B142     062312        B34     017060        CMD11C  050240        DEENER= 104421
BIT3   = 000010        B143     062350        B35     023232        CMD19L= 000070        DETAIL  071364
```

DETFLA	002326	DT13	102504	EM37	105760	E121	060040	E203	071110
DETPSW	002324	DT14	102530	EM38	106025	E122	060212	E204	071670
DETR0	002306	DT16	102556	EM39	106133	E123	060460	E205	071670
DETR1	002310	DT17	102610	EM4	103311	E124	060450	E206	071760
DETR2	002312	DT18	102616	EM40	106220	E125	060432	E207	072044
DETR3	002314	DT19	102634	EM41	106272	E126	060536	E21	013244
DETR4	002316	DT2	102264	EM42	106374	E127	061006	E210	072130
DETR5	002320	DT20	102652	EM43	106477	E13	012530	E211	072330
DETSP	002322	DT21	102662	EM44	106575	E130	061702	E22	013620
DF1	102740	DT22	102700	EM45	106672	E131	061672	E23	013714
DF10	103076	DT23	102706	EM46	106773	E132	061656	E24	014264
DF11	103103	DT24	102714	EM47	107062	E133	061540	E25	014562
DF12	103114	DT25	102720	EM48	107170	E134	061646	E26	015202
DF13	103116	DT3	102302	EM49	107267	E135	062264	E27	017256
DF14	103125	DT4	102312	EM5	103357	E136	062254	E3	010364
DF2	102743	DT5	102322	EM6	103434	E137	062240	E30	017230
DF3	102767	DT6	102346	EM7	103461	E14	012716	E31	017166
DF4	103004	DT7	102362	EM8	103521	E140	062122	E32	017166
DF5	103021	DT8	102416	EM9	103556	E141	062230	E33	017152
DF6	103036	DT9	102432	ENASBE=	104506	E142	062544	E34	017122
DF7	103053	DUMMY	002304	ENA1SB=	104507	E143	062530	E35	023316
DF8	103067	DUMPCS=	000204	END	117144	E144	062436	E36	024574
DF9	103071	ECCDIS=	104470	ENERGI=	104420	E145	062520	E37	024560
DH1	107366	ECCINI=	104472	ERRMAX	002702	E146	062772	E4	010612
DH10	110145	ECC1DI=	104471	ERROR =	104000	E147	062756	E40	024746
DH11	110243	ECC1IN=	104473	ERRPC	002024	E15	013066	E41	024732
DH12	110272	EMTVEC=	000030	ERRPSW	002034	E150	062662	E42	025112
DH13	110307	EM1	103134	ERRSP	002030	E151	062744	E43	033756
DH14	110415	EM10	103633	ERRVEC=	000004	E152	063254	E44	033742
DH15	110533	EM11	103677	EVEN	002456	E153	063112	E45	033556
DH16	110655	EM12	103721	EXBANK	042422	E154	063170	E46	033726
DH17	110672	EM13	103745	EXCMD3	044726	E155	063240	E47	034002
DH18	110746	EM14	103777	EXCMD4	045236	E156	063240	E5	010612
DH19	111023	EM15	104043	EXIT	043522	E157	063576	E50	034026
DH2	107423	EM16	104111	EXIT2	043526	E16	013066	E51	040066
DH20	111037	EM17	104137	E0	005530	E160	063562	E52	040066
DH21	111056	EM18	104177	E1	010242	E161	063470	E53	040232
DH22	111063	EM19	104256	E10	011444	E162	063514	E54	040232
DH23	111111	EM2	103220	E100	054364	E163	063542	E55	040504
DH3	107446	EM20	104333	E101	054124	E164	063672	E56	040504
DH4	107502	EM21	104415	E102	054216	E165	063672	E57	041302
DH5	107507	EM22	104454	E103	054342	E166	064174	E6	010672
DH6	107615	EM23	104501	E104	054330	E167	064044	E60	041262
DH7	107664	EM24	104530	E105	054304	E17	013056	E61	041442
DH8	110006	EM25	104607	E106	054412	E170	064122	E62	041422
DH9	110106	EM26	104634	E107	054466	E171	064160	E63	042562
DIAGFL	002006	EM27	104705	E11	011432	E172	064160	E64	046456
DISPLA	002770	EM28	104774	E110	054542	E173	064466	E65	047006
DISPRE=	000174	EM29	105027	E111	054542	E174	064456	E66	047720
DISPTB	014370	EM3	103256	E112	055440	E175	064354	E67	050232
DNSLAV	055170	EM30	105111	E113	055440	E176	064442	E7	011076
DOBACK	015104	EM31	105230	E114	055746	E177	064570	E70	050552
DSWR -	177570	EM32	105330	E115	055746	E2	010364	E71	050552
DT1	102252	EM33	105435	E116	057602	E20	013160	E72	050626
DT10	102444	EM34	105543	E117	057516	E200	070402	E73	051042
DT11	102466	EM35	105624	E12	012530	E201	070474	E74	053074
DT12	102476	EM36	105711	E120	057752	E202	071110	E75	053062

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E76     053734          IIII  = 177777        KI2     002554          L1016   070460          L127    012700
E77     053730          IISTAC  002736        KI3     002556          L1017   070542          L13     005376
FASTCI= 177640          IISTAD  002740        KI4     002560          L102    011414          L130    012700
FATAL$  002070          IISTIN  061074        KI5     002562          L1020   070602          L131    012764
FCMD10  047550          IISTOF  061174        KI6     002564          L1021   070570          L132    013046
FCMD11  047734          IISTVE  002742        KI7     002566          L1022   070576          L133    013046
FCMD12  050330          IITRAP  036764        KMAP  = 104422          L1023   070624          L134    013160
FCMD13  050356          INCBNK  042772        KPFLAG  002122          L1024   070640          L135    013174
FCMD14  050400          INCMAR  043006        KSTACK  002706          L1025   070654          L136    013254
FCMD15  050420          INCPAT  042746        LAST  = 157776          L1026   070670          L137    013226
FCMD16  050436          INCRPT  042746        LASTB   002262          L1027   071072          L14     005470
FCMD17  050454          INTERL  002264        LASTER  002020          L103    011416          L140    013620
FCMD18  050470          INTER0  006756        LBLS0 = 001057          L1030   071072          L141    013472
FCMD19  050502          INTER1  006760        LBLS1 = 001055          L1031   071056          L142    013472
FCMD20  050566          INTER2  006760        LBLS10= 000223          L1032   071122          L143    013472
FIELDS  043774          INTER3  006766        LBLS11= 000034          L1033   071200          L144    013416
FINDBA= 000061          INTER4  006766        LBLS2 = 001050          L1034   071230          L145    013434
FIRST = 060000          INTER5  006774        LBLS3 = 001051          L1035   071260          L146    013452
FIRSTB  002260          INTER6  006766        LBLS4 = 001032          L1036   071302          L147    013470
FIRSTP= 000010          INTER7  006774        LBLS5 = 000712          L1037   071332          L15     005510
FLIPLO  002734          INTKRA  017610        LBLS6 = 000714          L104    011532          L150    013604
FLIPWA  035214          INT..0  020234        LBLS7 = 000033          L1040   071362          L151    013534
FLUSH   014656          INT..1  020260        LCSROU= 000055          L1041   071646          L152    013542
FSCMD0  044170          INT..2  020324        LCSRRE= 000114          L1042   072046          L153    013604
FSCMD1  044256          INT..3  020350        LCSRSA= 000112          L1043   072052          L154    013702
FSCMD2  044346          INT..4  020414        LF    = 000012          L1044   072132          L155    013656
FSCMD3  044520          INT..5  020440        LKS   = 177546          L1045   072136          L156    013702
FSCMD4  044764          INT..6  020504        LOADBA  002532          L1046   072316          L157    014032
FSCMD5  045274          INT..7  020530        LOADCS= 104425          L1047   072264          L16     005570
FSCMD6  046152          INT.10  020574        LOADER= 000057          L105    011574          L160    014112
FSCMD7  046160          INT.11  020574        LOADHO  002710          L1050   072316          L161    014116
FSCMD8  046510          INT.12  020616        LOADRS= 177740          L1051   072316          L162    014336
FSCMD9  047104          INT.13  020642        LOCK    002670          L1052   073034          L163    014254
FSINFL  002542          INT.14  020706        LOOP    014342          L1053   073452          L164    014172
FSPAT   045752          INT.15  020732        LOWMAP  042026          L1054   073540          L165    014174
FSSTAC  002374          INT.16  020776        LST$$ = 000000          L1055   073464          L166    014234
FS1     044052          INT.17  021022        LWDBE = 000053          L1056   073600          L167    014250
FS7FLA  002546          INVALI= 104511        LWSBE = 000051          L1057   073602          L17     005654
GBLENG= 000076          IOTVEC= 000020        L0      004426          L106    011614          L170    014304
GDSWIT  002476          ISECCO  017300        L1      004422          L107    011634          L171    014306
GETDAT  055030          J       002604        L10     005376          L11     005376          L172    014336
GETDA1  055156          KAMIKA  002010        L100    011552          L110    011654          L173    014456
GETDIS  066514          KAMITE  026006        L1000   067226          L111    011672          L174    014566
GETSIZ  017736          KDIAG = 000010        L1001   067240          L112    011714          L175    014546
GOOD    002050          KDPAR0= 172360        L1002   067276          L113    011766          L176    014546
GOOD2   002052          KDPAR7= 172376        L1003   067306          L114    012034          L177    014622
GOOD3   002054          KDPDR7= 172336        L1004   067630          L115    012130          L2      004536
GTSWR = 104407          KERNEL= 104417        L1005   070316          L116    012250          L20     005616
HEADER  002724          KERSTK= 002000        L1006   070234          L117    012372          L200    014622
HIACBA  002514          KIPAR0= 172340        L1007   070234          L12     005370          L201    014656
HIADRS= 177742          KIPAR4= 172350        L101    011416          L120    012422          L202    014734
HIBANK  002512          KIPAR5= 172352        L1010   070274          L121    012416          L203    014744
HIPAT   042762          KIPAR6= 172354        L1011   070262          L122    012420          L204    015100
HT      000011          KIPAR7= 172356        L1012   070270          L123    012514          L205    015166
HUNGMS  002572          KIPDR0= 172300        L1013   070360          L124    012474          L206    015306
HUNGTI  002574          KI0     002550        L1014   070366          L125    012474          L207    015422
.       002602          KI1     002552        L1015   070452          L126    012550          L21     005634
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L210	015560	L273	022546	L355	025200	L437	040210	L520	045574
L211	015716	L274	022600	L356	025152	L44	007700	L521	045714
L212	016054	L275	022614	L357	025224	L440	040210	L522	045716
L213	016234	L276	022624	L36	006630	L441	040252	L523	046232
L214	016372	L277	022624	L360	025350	L442	040260	L524	046234
L215	016552	L3	005046	L361	025540	L443	040376	L525	046442
L216	016674	L30	006242	L362	025756	L444	040432	L526	046602
L217	017230	L300	022662	L363	025770	L445	040462	L527	046604
L22	005636	L301	022672	L364	026030	L446	041114	L53	010202
L220	017152	L302	022672	L365	026036	L447	041144	L530	046630
L221	017034	L303	022732	L366	026042	L45	007714	L531	046644
L222	017152	L304	022746	L367	033434	L450	041246	L532	046646
L223	017134	L305	022756	L37	006712	L451	041276	L533	046772
L224	017214	L306	022756	L370	033444	L452	041410	L534	047154
L225	017366	L307	023010	L371	033556	L453	041410	L535	047156
L226	017372	L31	006356	L372	033506	L454	041410	L536	047272
L227	017724	L310	023024	L373	033520	L455	041410	L537	047274
L23	005714	L311	023034	L374	033536	L456	041410	L54	010300
L230	020016	L312	023034	L375	033544	L457	041436	L540	047320
L231	020030	L313	023066	L376	033570	L46	010226	L541	047720
L232	020072	L314	023102	L377	033726	L460	041534	L542	047704
L233	020110	L315	023112	L4	005144	L461	042550	L543	047654
L234	020224	L316	023112	L40	006734	L462	042720	L544	050026
L235	020306	L317	023172	L400	033626	L463	043026	L545	050030
L236	020314	L32	006406	L401	033640	L464	043114	L546	050054
L237	020376	L320	023202	L402	033672	L465	043134	L547	050070
L24	005774	L321	023202	L403	033656	L466	043230	L55	010304
L240	020404	L322	023300	L404	033670	L467	043232	L550	050072
L241	020466	L323	023270	L405	033714	L47	010226	L551	050216
L242	020474	L324	023400	L406	033702	L470	043256	L552	050534
L243	020556	L325	023402	L407	033714	L471	043264	L553	050536
L244	020564	L326	023432	L41	007152	L472	043410	L554	050724
L245	020614	L327	023436	L410	034026	L473	043410	L555	050726
L246	020670	L33	006476	L411	035504	L474	043364	L556	051030
L247	020676	L330	023466	L412	036150	L475	043410	L557	050774
L25	006010	L331	023472	L413	036220	L476	043444	L56	010306
L250	020760	L332	023526	L414	036246	L477	043542	L560	051010
L251	020766	L333	023532	L415	036240	L5	005222	L561	051026
L252	021050	L334	023562	L416	036246	L50	010166	L562	051056
L253	021056	L335	023566	L417	037136	L500	043546	L563	051170
L254	021174	L336	023744	L42	007156	L501	043554	L564	051414
L255	021216	L337	023776	L420	037142	L502	043574	L565	051514
L256	021232	L34	006564	L421	037202	L503	043606	L566	051644
L257	021250	L340	024042	L422	037206	L504	044016	L567	051656
L26	006160	L341	024206	L423	037424	L505	044026	L57	010350
L260	021254	L342	024216	L424	037432	L506	044160	L570	052414
L261	021256	L343	024216	L425	037510	L507	044220	L571	052442
L262	021322	L344	024544	L426	037544	L51	010166	L572	052510
L263	021344	L345	024530	L427	037634	L510	044224	L573	052522
L264	021372	L346	024544	L43	007160	L511	044246	L574	053076
L265	021372	L347	024610	L430	037670	L512	044252	L575	053202
L266	021522	L35	006614	L431	037730	L513	045416	L576	053200
L267	021566	L350	024716	L432	037772	L514	045456	L577	053232
L27	006160	L351	024702	L433	040044	L515	045510	L6	005246
L270	022522	L352	024716	L434	040044	L516	045512	L60	010346
L271	022536	L353	025076	L435	040106	L517	045536	L600	053232
L272	022546	L354	025076	L436	040114	L52	010166	L601	053734

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L602    053722      L665    061636      L747    065762      MHALT2  005770      MSG024  113316
L603    053726      L666    061630      L75     011306      MHALT3  012760      MSG025  113340
L604    054350      L667    062240      L750    065774      MINDEX  002666      MSG026  113371
L605    054200      L67     011110      L751    066006      MJPAT   021600      MSG027  113403
L606    054272      L670    062040      L752    066030      MJSIZE  002466      MSG028  113420
L607    054314      L671    062066      L753    066076      MJTEST  021512      MSG029  113434
L61     010576      L672    062220      L754    066156      MKCONT  016664      MSG030  113454
L610    054450      L673    062212      L755    066172      MKCSRS  002334      MSG031  113473
L611    054526      L674    062530      L756    066174      MKCSRT  020124      MSG032  113533
L612    054532      L675    062402      L757    066250      MKFLAG  002126      MSG033  113552
L613    054626      L676    062502      L76     011320      MKPAT   021402      MSG034  113571
L614    054642      L677    062756      L760    066316      MKSIZE  002470      MSG035  113707
L615    054646      L7      005316      L761    066312      MKTEST  021222      MSG036  113712
L616    054664      L70     011224      L762    066316      Mk11AD= 172100      MSG037  113731
L617    055024      L700    062726      L763    066350      MMR0    = 177572    MSG038  113750
L62     010672      L701    063010      L764    066360      MMR1    = 177574    MSG039  113766
L620    055174      L702    063240      L765    066624      MMR2    = 177576    MSG040  114010
L621    055312      L703    063152      L766    066746      MMR3    = 172516    MSG041  114055
L622    055416      L704    063224      L767    066746      MMTRAP  036740      MSG042  114102
L623    055550      L705    063230      L77     011332      MMVEC   = 000250    MSG043  114123
L624    055724      L706    063272      L770    067116      MOVELO= 000124      MSG044  114150
L625    057152      L707    063306      L771    067050      MP1     012070      MSG045  114175
L626    057136      L71     011236      L772    067074      MP2     012224      MSG046  114231
L627    057152      L710    063562      L773    067076      MP3     012716      MSG047  114264
L63     011076      L711    063562      L774    067116      MP4     012552      MSG048  114303
L630    057314      L712    063454      L775    067300      MP5     012764      MSG049  114343
L631    057202      L713    063450      L776    067164      MRUNSE  053640      MSG050  114375
L632    057216      L714    063454      L777    067276      MSEEDH  002720      MSG051  114503
L633    057232      L715    063662      MAINT   = 177750    MSEEDL  002722      MSG052  114523
L634    057326      L716    063662      MAPH0   = 170202    MSGA34  113625      MSG053  114554
L635    057604      L717    063722      MAPH36= 170372      MSGA87  115753      MSG054  114572
L636    057564      L72     011250      MAPH37= 170376      MSGA98  116242      MSG055  114642
L637    060040      L720    064160      MAPL0   = 170200    MSGB34  113642      MSG056  114663
L64     011076      L721    064104      MAPL1   = 170204    MSG000  111176      MSG057  114716
L640    057724      L722    064150      MAPL36= 170370      MSG001  111254      MSG058  114722
L641    060022      L723    064224      MAPPER  040700      MSG002  111336      MSG059  114766
L642    060174      L724    064230      MARGIN  002112      MSG003  111413      MSG060  115016
L643    060174      L725    064442      MASTER= 000020      MSG004  111520      MSG061  115060
L644    060416      L726    064336      MAST01  057372      MSG005  111626      MSG062  115067
L645    060366      L727    064344      MAST02  060046      MSG006  111640      MSG063  115107
L646    060554      L73     011262      MAST03  060220      MSG007  111675      MSG064  115120
L647    060572      L730    064424      MAST04  061322      MSG008  111707      MSG065  115130
L65     011060      L731    064552      MAST05  061706      MSG009  111721      MSG066  115142
L650    060610      L732    065346      MAST06  062270      MSG010  111733      MSG067  115225
L651    060626      L733    065360      MAST07  062550      MSG011  111745      MSG068  115234
L652    060644      L734    065376      MAST10  062776      MSG012  112033      MSG069  115241
L653    060662      L735    065400      MAST11  063260      MSG013  112130      MSG070  115246
L654    060700      L736    065420      MAST12  063732      MSG014  112132      MSG071  115271
L655    060716      L737    065432      MAST13  064200      MSG015  112134      MSG072  115304
L656    060734      L74     011274      MAST14  064204      MSG016  112136      MSG073  115317
L657    060746      L740    065450      MAST15  064472      MSG017  112150      MSG074  115336
L66     011060      L741    065452      MASWR   002674      MSG018  112161      MSG075  115341
L660    061162      L742    065466      MDISPL  002676      MSG019  112164      MSG076  115373
L661    061162      L743    065676      MEMDON  014410      MSG020  112170      MSG077  115414
L662    061656      L744    065704      MEMERR= 177744      MSG021  112224      MSG078  115430
L663    061456      L745    065732      MEMSIZ= 000004      MSG022  113252      MSG079  115474
L664    061504      L746    065750      MHALT1  004532      MSG023  113274      MSG080  115520
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MSG081  115560      MTPC26  034646      MT0027  024370      O.CSR2  075575      O.STM =  000340
MSG082  115577      MTPD03  026630      MT0030  024754      O.CT    075730      O.SVR    100360
MSG084  115617      MTPD21  033354      MT0031  025214      O.CTLC  076162      O.SVTT   100500
MSG085  115661      MTPD25  034412      MT0033  025340      O.CTLE  076242      O.T      075572
MSG086  115706      MTPD26  034666      MT0034  025530      O.CTLF  076210      O.TBIT   077644
MSG087  115745      MTPE25  034434      MT0035  025652      O.C1    100000      O.TBT =  000020
MSG088  115760      MTP000  026376      MT020X  023604      O.DCD   076520      O.TCL2   076442
MSG089  115776      MTP001  026422      MT020Y  023472      O.DCDA  077144      O.TCSR=  177564
MSG090  116020      MTP002  026454      MT020Z  023322      O.DCD1  076550      O.TDB =  177566
MSG091  116034      MTP005  026724      MT0999  025772      O.DCD3  076530      O.TL     101345
MSG092  116046      MTP006  026760      MULHLT  056150      O.DOT   075562      O.TRTC   101370
MSG093  116062      MTP007  027150      MULTIE  060746      O.ERR   076510      O.TVEC=  000014
MSG094  116070      MTP010  027250      MULTIO  002004      O.ERR1  077572      O.TYPE   101126
MSG095  116077      MTP011  027356      MULTIP  003014      O.ERR2  077164      O.TYP1   101004
MSG096  116106      MTP012  027766      MULTIU  056142      O.ERR3  077150      O.UIN    075752
MSG097  116137      MTP013  030344      MUT     002116      O.FIL   075576      O.UPC    075700
MSG098  116234      MTP014  030716      M13BAL  054472      O.FTYP  100730      O.URO    075662
MSG099  116245      MTP015  031312      NEMCNT  002072      O.GET   101006      O.USP    075676
MSG100  116256      MTP016  031700      NEWBAN  002400      O.GO    077576      O.UST    075702
MSG101  116305      MTP017  032302      NEWKER  042322      O.GOGO  077624      O.WRD    076760
MSG102  116335      MTP020  032360      NEWLOA  042370      O.GO2   077676      O.WRD1   077036
MSG103  116364      MTP022  033404      NOBALA= 000164      O.ID    101300      O.WST    101202
MSG104  116421      MTP025  034152      NOCLOC  002104      O.IDND= 101315      O.XXX    075564
MSG105  116423      MTP030  034704      NOECCF  002474      O.LG  = 000020      PADDRE   002042
MSG106  116527      MTP031  034714      NOERRO  002530      O.LGCH  101321      PAFBAF   015730
MSG107  116545      MTP033  035054      NOFSMO  002526      O.MIN   076502      PAFBAW   016066
MSG108  116622      MTP034  035106      NOLIST  002756      O.MINS  075603      PARBAF   016246
MSG109  116664      MTP20A  032360      NONEM   002102      O.ODT   075774      PARBAW   016404
MSG110  116737      MTP20B  032376      NONEXI  036646      O.OFST  077466      PARCNT   002074
MSG111  117003      MTP20C  032430      NOPAR   002100      O.OLD   077154      PARITY   036454
MSG112  117035      MTP20D  032462      NOSCOP  002540      O.OP1   077160      PARTHE   002372
MSG113  117103      MTP20E  032514      NOTAB   002464      O.OP2   077220      PARVEC=  000114
MSG114  117113      MTP20F  032546      NULLFL  002436      O.OP2A  077226      PASFLG   002362
MSG115  117123      MTV020  023320      OLDCAC  002370      O.ORAB  076364      PATERR   002076
MSG116  117133      MT0000  021704      OLDMAR  002376      O.ORPC  076342      PATPLU   005472
MST11A  063602      MT0001  021740      ONCE    002732      O.ORRB  076374      PATTER   002120
MTA030  024760      MT0002  022000      ONES    002726      O.P     075573      PCBUMP   002406
MTEST   016564      MT0003  022050      O.ADR1  075706      O.PRI   075704      PCONFI   035402
MTPA03  026506      MT0004  022216      O.BACK  077302      O.PROC  077732      PCONFS   035662
MTPA04  026650      MT0005  022300      O.BD    101366      O.PR1   077764      PCONF1   035572
MTPA20  032572      MT0006  022360      O.BIAS  075604      O.RALL  077430      PCONF2   035630
MTPA21  033234      MT0007  022414      O.BKP = 000016      O.RCSR= 177560      PDP110   036752
MTPA24  034060      MT0010  022456      O.BKPT  077324      O.RDB = 177562      PENDBO   002330
MTPA25  034464      MT0011  022512      O.BK1   100060      O.REGT  076270      PERA05   064732
MTPA26  034576      MT0012  022570      O.BRK   100042      O.REM   100602      PERBNK   065564
MTPA32  034772      MT0013  022646      O.BW    075566      O.RORA  101272      PERECC   065650
MTPB03  026550      MT0014  022722      O.BYT   076772      O.RRST  101172      PERRAB   065402
MTPB04  026704      MT0015  023000      O.CAD   075560      O.RSB   100450      PERRAW   065330
MTPB21  033264      MT0016  023056      O.CADV  100634      O.RSR   100416      PERRA3   054652
MTPB24  034120      MT0017  023134      O.CLGT= 000024      O.RSTT  100534      PERRA7   065454
MTPB25  034504      MT0020  023156      O.CLSE  101214      O.S     075571      PERR01=  104427
MTPB26  034612      MT0021  023612      O.CMFD  075600      O.SCAN  076554      PERR02=  104430
MTPB32  035020      MT0022  023734      O.CR    101316      O.SCRN  075602      PERR03=  104431
MTPC03  026610      MT0023  023766      O.CRET  077140      O.SEMI  076742      PERR04=  104432
MTPC21  033320      MT0024  024032      O.CRLF  101246      O.SEQ   075570      PERR05   064726
MTPC24  034134      MT0025  024172      O.CRLS  101254      O.SMFD  075601      PERR06   064754
MTPC25  034536      MT0026  024240      O.CSR1  075574      O.SNGL  076446      PERR07=  104433
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PERR10= 104434          RESTAR  002752          START1  000300          TAG72$  067656          TST1    006260
PERR11= 104435          RESVEC= 000010          START2  000310          TAG73$  067722          TST2    007004
PERR12= 104436          RLFLAG  002134          START3  000200          TAG74$  067730          TST3    007160
PERR13= 104437          RRFLAG  002132          START4  000322          TAG75$  067742          TST4    010310
PERR14= 104440          RTNVAL=%000000          STOPCP  011720          TAG76$  067754          TST5    014342
PERR15= 104441          RUNCOU= 000171          STOPOK  002520          TAG77$  067776          TST6    014414
PERR16= 104442          SAMESA= 000015          STRIPE  002460          TAG78$  070000          TST7    014456
PERR17= 104443          SAVREG= 104415          STRTDI  002364          TAG79$  070006          TWOCSR  002600
PERR20= 104444          SBECSR  002150          SUBAAA  005532          TAG80$  070066          TYPDS = 104405
PERR21= 104445          SBEFLA  002022          SUBAAB  005200          TAG81$  070100          TYPEIT= 104401
PERR22= 104446          SBEMSK  002350          SUBAAQ  007720          TAG82$  070122          TYPOC = 104402
PERR23= 104447          SBETES  017374          SUBAAR  013160          TAG83$  070324          TYPOS = 104403
PERR24= 104450          SCOPE - 000004          SUBAAS  007002          TAG84$  070410          TYPS0 = 000000
PERR25= 104451          SDPAR0= 172260          SUBAAT  011334          TAG85$  070502          TYPS1 = 000000
PERR26= 104452          SDPAR7= 172276          SUBAAU  014602          TAG86$  070612          TYPS10= 000000
PERR27= 104453          SDPDR7= 172236          SUCCES  002424          TAG9$   007232          TYPS11- 000002
PERR30= 104454          SECOND= 011661          SUPDOA  002360          TASK    002616          TYPS2 = 000000
PERR31= 104455          SEEDHI  002714          SUPDO1  026042          TASKDO  050726          TYPS3 = 000000
PERR32= 104456          SEEDLO  002716          SUPDO2  026056          TASKRE  050710          TYPS4 = 000000
PERR33= 104457          SELONL  002002          SUPDO3  026220          TASK00  051234          TYPS5 - 000000
PERR34= 104460          SETMAR  043212          SUPDO4  026234          TASK01  051236          TYPS6 = 000000
PERR35= 104461          SETPAT  042762          SUPDR0  002266          TASK02  051330          TYPS7 = 000002
PERR36= 104462          SHALT   004420          SUPDR1  002270          TASK03  051430          T12A    031700
PERR37= 104463          SHUTUP  043554          SUPDR2  002272          TASK04  051664          T12B    031722
PERR40= 104464          SIDE    002422          SUPDR3  002274          TASK05  051774          UDPAR0= 177660
PERR41= 104465          SIDEOK  021066          SUPDR4  002276          TASK06  052300          UDPAR1= 177662
PERR42= 104466          SIPAR0= 172240          SUPDR5  002300          TASK07  052326          UDPAR7= 177676
PERR43= 104467          SIPAR3= 172246          SUPDR6  002302          TASK10  052336          UDPDR7= 177636
PERXOR  065540          SIPDR0= 172200          SUPLIM  057372          TASK11  052536          UIPAR0= 177640
PFLAG   002130          SIZE  = 040000          SUPM13  053752          TASK12  052644          UIPAR2= 177644
PHYADD  002044          SIZELO= 177760          SUPSTK= 000740          TASK13  052726          UIPAR3= 177646
PORTCO  002646          SKIPKA  002012          SWAPAT  002764          TASK14  053276          UIPAR4= 177650
PORTDI  002606          SLAVEM  061244          SWR     002766          TASK15  053310          UIPAR5= 177652
PROTEC= 000002          SLAVEN  075774          SWREG = 000176          TASK16  053316          UIPAR6= 177654
PSW   = 177776          SLAVER  002570          SW0   = 000001          TASK17  053334          UIPAR7= 177656
PTYBUF  002636          SLAVES  002730          SW1   = 000002          TASK20  053422          UIPDR0= 177600
PTYFLA  002626          SLAVE1= 000040          SW10  = 002000          TASK7A  052344          UNITOP  002516
PWLOCK  002760          SLAVE2= 000100          SW11  = 004000          TBG4$   026314          UNRELO  041604
PWRVEC= 000024          SLAVE3= 000200          SW12  = 010000          TCFIG1  036012          UPPFLG  002363
QUE     072154          SLAVUP  061216          SW13  = 020000          TCONFI  035664          UP2     056154
QUE1    072222          SLFLAG  002656          SW14  = 040000          TEMP    002534          USERMA  042240
QUICK   002536          SLPAT   051570          SW15  = 100000          TESTAD  002506          USESTK= 000700
QVFLAG  002440          SLPAT0  051530          SW2   = 000004          TIME    002434          USP   =%000006
RANODD  034626          SLPAT1  051534          SW3   - 000010          TIMEOU  036726          WAITST  012034
RDCHR = 104411          SLPAT2  051542          SW4   = 000020          TKVEC = 000060          WAIT5   063674
RDDEC = 104414          SLPAT3  051550          SW5   = 000040          TMFLAG  002140          WAKEUP  054544
RDLIN = 104412          SLPAT4  051556          SW6   = 000100          TOOMAN  002472          WARN1   007320
RDOCT = 104413          SLPAT5  051564          SW7   = 000200          TRAPVE= 000034          WARN2   026522
READCS= 104426          SOBK    002704          SW8   = 000400          TRT   = 000003          WARN3   026536
READON  002504          SOBLEN= 000056          SW9   = 001000          TSK05A  052240          WARN4   026562
REALPA  002366          SOFTPA  002744          SYSSIZ  011210          TSK13A  053100          WARN5   026576
REFRES  033760          SOURCE  002402          SYSTID  177764          TSK13B  053136          WARN6   035364
REFSUB  034030          SPECIA  002432          TAG2$   007366          TSK20A  053602          WARN7   024416
REGCOP  035204          SSP   -%000006          TAG3$   007412          TSTBAN  007606          WASDBE= 104500
RELOCA  041130          ST    - 177776          TAG4$   026136          TSTDAT  002344          WASSBE= 104476
RELOC1  041456          STACK   002000          TAG70$  067636          TSTRD1  037434          WAS1DB= 104501
RESREG  104416          STAR    004352          TAG71$  067646          TSTREA- 104510          WAS1SB= 104477
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SYMBOL TABLE

WHICHC 050630
WHOBOX 070672
WHODUN= 000202
WOOPEN 056512
WOOPS 056160
WOOPSA 056542
WOOPUP 056336
WORST 002712
WRITEO 002502
XXDPCH 002446
ZERO 002426
ZEROS 002430
$APTHD 075236
$AUTO 002066
$BANK 002015
$BASE 075210
$BELL 003003
$CACHF 037066
$CACHN 037050
$CBCSR 037700
$CB1CS 037742
$CDW1 075214
$CDW2 075216
$CHARC 057356
$CHKDI 040354
$CHK1D 040410
$CKSWR 073022
$CLRCS 040322
$CLR1C 040340
$CMTAG 002000
$CMTGE 002700
$CNTLC 074224
$CNTLG 074236
$CNTLU 074231
$CPUOP 075162
$CRLF 003010
$DBLK 073012
$DB20 075014
$DDW0 075220
$DDW1 075222
$DDW2 075224
$DDW3 075226
$DDW4 075230
$DDW5 075232
$DDW6 075234
$DEENE 037040
$DEVCT 075144
$DEVM 075212
$DIDDO= 000000
$DOAGA 015040
$DOAGN 015010
$DOWN 055532
$DTBL 073002
$ECCDI 037466
$ECCIN 037554
$ECC1D 037522
$ECC1I 037574
$ENASB 037612
$ENA1S 037646
$ENDAD 015000
$ENERG 037030
$ENV 075154
$ENVM 075155
$EOP 014662
$ERFLG 002016
$ERROR 066662
$ERRTB 101372
$ERRTY 067324
$ERTTL 002754
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$ETEND 075236
$EXHAL 043546
$ES - 000001
$FATAL 075136
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$FILLS 002451
$FS = 000000
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$HALT 067136
$HALT2 075312
$HIBTS 075236
$HIOCT 074434
$ILLUP 056134
$INVAL 040510
$ITEMB 002017
I 000001
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$KMAP 041016
K = 000204
$L = 000212
$LF 003011
$LL = 000210
$LOADC 037076
$LOAD1 037146
$LPADR 002746
$LPERR 002750
L - 000000
$MADR1 075166
$MADR2 075172
$MADR3 075176
$MADR4 075202
$MAIL 075134
$MAMS1 075164
$MAMS2 075170
$MAMS3 075174
$MAMS4 075200
$MBADR 075240
$MNEW 074254
$MSGAD 075150
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$MSGTY 075134
$MSWR 074243
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$MTYP4 075201
$NOTRA 075306
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$OCT8 = 075122
$OMODE 072574
$OVER 066502
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$PASTM 075244
$PATMA 002014
$PER01 064574
$PER02 064622
$PER03 064650
$PER04 064700
$PER07 064762
$PER10 065004
$PER11 065034
$PER12 065054
$PER13 065076
$PER14 065116
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$PER30 054762
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$PER32 066016
$PER33 066064
$PER34 066144
$PER35 066176
$PWRDN 055160
$PWRUP 055536
$QUES 003007
$R = 177777
$RAND 074720
$RDCHR 073602
$RDDEC 074436
$RDLIN 073722
$RDOCT 074266
$READC 037220
$RESRE 074662
$SAVRE 074624
$SAVR6 056140
$SCOPE 066232
$STN = 000001
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SV = 000000
$SWR = 163000
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$T = 001060
$TESTN 075140
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$TN = 000010
$TPB 003000
$TPFLG 002452
$TPS 002776
$TRAP 075252
$TRAP2 075274
$TRPAD 075314
$TSTM 075242
$TSTRD 037310
$TTYIN 074200
$TYPDS 072576
$TYPE 056752
$TYPEC 057076
$TYPEX 057360
$TYPOC 072374
$TYPON 072410
$TYPOS 072350
$T1 = 000000
$T2 = 001057
$UNIT 075146
$UNITM 075246
$USWR 075160
$VECT1 075204
$VECT2 075206
$WASDB 040146
$WASSB 040002
$WAS1D 040262
$WAS1S 040116
$XTSTR 066370
Y = 000000
$ZAP42 014760
Z = 000000
$$S 000000
$$T = 001040
$$IT = 001042
$OFILL 072573

. ABS. 117144 000
000000 001
ERRORS DETECTED: 0

VIRTUAL MEMORY USED: 30717 WORDS (120 PAGES)
DYNAMIC MEMORY: 21872 WORDS (84 PAGES)
ELAPSED TIME: 01:51:56
,CEMKAB.LS2/CRF:SYM/-SP=CEMKAB.BIG,CEMKAB.MLB/ML,CEMKAB.MA1,CEMKAB.MA2

CEMKAB CREATED BY MACRO ON 3-AUG-79 AT 17:42 PAGE 1
SYMBOL CROSS REFERENCE (REF V01)

SYMBOL	VALUE	REFERENCES								
ABORTF	002142	#39-1166	*282-6181	394-570	396-607	*396-625	449-1990	449-1993	449-2002	449-2005
ACFLAG	002124	#39-1159	72-2036	76-2113	*78-2125	78-2126	82-2210	95-2576	95-2590	103-2754
		110-2847	112-2863	114-2897	116-2931	118-2972	121-3018	123-3060	125-3109	127-3151
		132-3240	170-4136	170-4159	172-4190	314-6654	*325-6878	*325-6889	352-7479	354-7533
		358-7682	390-466	413-1076	421-1252	424-1317	426-1377	428-1425	430-1467	434-1534
		438-1623	440-1684							
ACK	002672	#41-1308	*46-1404	46-1410	*90-2385	91-2424	91-2431	*91-2440	*91-2479	
ACTFLA	002442	#39-1239	*53-1534	66-1826	70-2022	150-3655	150-3668	159-3888	159-3897	159-3905
		159-3915	161-3926	161-3935	163-3950	163-3989	163-3995	163-4002	163-4008	166-4091
		180-4326	336-7055	461-2263						
ADDPAR	014570	103-2751	#103-2768							
ADDRES	002040	#39-1134	*66-1820	*80-2174	*207-4742	*207-4756	*210-4814	*210-4828	*213-4901	*284-6213
		*386-408	*386-416	*394-569	*394-569	*394-591	*396-606	*396-606	396-609	396-619
		*446-1883	*446-1884	*446-1889	*446-1890	*446-1895	*446-1896	*446-1901	*446-1902	*446-1909
		*446-1917	*446-1922	*446-1922	*446-1927	*446-1932	*448-1938	*448-1943	*448-1948	*448-1953
		*448-1958	*448-1963	*448-1968	*448-1973	*448-1978	*448-1983	*453-2053	*455-2083	*455-2092
		469-2434	478-2631	478-2633	478-2633	478-2635	478-2635	478-2638	478-2640	478-2640
		478-2642	478-2642	561-4700	561-4703	561-4706	561-4708	561-4713	561-4721	
ADD..0	071152	#476-2604	#478-2629							
ADD..1	071162	476-2605	#478-2631							
ADD..2	071202	476-2606	#478-2633							
ADD..3	071232	476-2607	#478-2635							
ADD..4	071262	476-2608	#478-2637							
ADD..5	071264	476-2609	#478-2638							
ADD..6	071304	476-2610	#478-2640							
ADD..7	071334	476-2611	#478-2642							
ALLCPU	002510	#39-1261	*91-2496	95-2572	390-463	*415-1113	*415-1115	*415-1116	421-1249	424-1314
		426-1374	428-1422	430-1464	434-1529	438-1620	440-1681			
APTCOP	002522	#39-1266	*99-2686	99-2694	561-4705					
APTDOW	043640	53-1529	#336-7085	336-7088	*336-7090					
APTFLA	002444	#39-1240	*53-1528	55-1547	99-2665	159-3888	159-3897	159-3905	159-3915	161-3926
		161-3935	163-3950	166-4091	180-4326	336-7055	461-2263			
APTHAN	015050	93-2558	#108-2832	108-2838						
APTHLT	043706	#336-7092								
APTMOS	002524	#39-1267	*99-2689	99-2694	561-4705					
APTSIZ	002544	#39-1275	*53-1524	99-2665						
BACKGN	035344	155-3840	155-3851	157-3870	165-4025	166-4070	#271-5940	332-7015		
BAD	002056	#39-1140	*80-2176	*91-2447	*91-2484	*99-2703	*386-407	*386-415	*390-484	*390-530
		*394-572	*394-594	*396-609	*396-623	*409-975	*409-1018	*411-1050	*413-1084	*413-1098
		*421-1267	*421-1289	*424-1331	*424-1353	*426-1403	*428-1444	*430-1480	*436-1591	*436-1605
		*438-1638	*440-1703	*442-1728	*446-1885	*446-1891	*446-1898	*446-1903	*446-1908	*446-1918
		*446-1923	*446-1928	*446-1933	*448-1939	*448-1944	*448-1949	*448-1954	*448-1959	*448-1964
		*448-1969	*448-1974	*448-1979	*448-1984	451-2031	*453-2054	*455-2084	*455-2093	*455-2094
		*455-2113	475-2567	475-2570	475-2573	475-2576	561-4700	561-4706	561-4708	561-4716
		561-4720	561-4721	561-4723	561-4725					
BADCSR	002000	#39-1115	471-2475	*476-2597	*476-2598					
BADPC	002026	#39-1129	*284-6240	394-583	449-1991	449-2003	451-2014	453-2064	455-2082	455-2091
		455-2102	460-2234	460-2235	*460-2239					
BADPSW	002036	#39-1133	*284-6241	455-2113	460-2238					
BADSP	002032	#39-1131	*284-6238	*284-6239	460-2237					
BADSTA	036770	282-6182	282-6196	284-6223	284-6227	284-6230	#284-6237	394-583	446-1911	449-1991
		449-2003	451-2014	453-2064	455-2082	455-2091	455-2102	455-2112		

SYMBOL	VALUE	REFERENCES								
BADXOR	002064	#39-1143	*451-2031	*451-2032	561-4706					
BAD2	002060	#39-1141	*394-595	561-4716						
BAD3	002062	#39-1142	*394-597	*394-598	561-4716					
BAFPAF	015204	100-2716	#112-2859	112-2888						
BAFPAR	015320	100-2717	#114-2893	114-2922						
BAKPAT	002762	#43-1342	*48-1451	165-4024	166-4069					
BANK	002106	#39-1152	*68-1842	*68-1849	68-1850	68-1852	68-1858	*68-1873	*70-1961	70-1962
		70-1967	*70-2018	70-2018	*70-2020	*72-2034	*72-2042	72-2042	*76-2111	*76-2116
		76-2116	76-2118	*78-2124	78-2126	*78-2127	78-2131	*82-2208	*82-2215	82-2215
		*82-2216	82-2219	*95-2564	*95-2622	95-2622	*103-2752	*103-2761	103-2761	*110-2845
		*110-2853	110-2853	*112-2860	*114-2894	*116-2928	*118-2969	*121-3013	*123-3055	*125-3104
		*127-3146	132-3228	*132-3238	132-3241	*132-3264	132-3264	*132-3279	*170-4134	170-4138
		*170-4150	170-4150	*170-4157	170-4160	*170-4173	170-4173	*172-4187	*172-4196	172-4196
		*172-4206	174-4224	176-4244	178-4282	178-4303	183-4335	186-4369	303-6520	*314-6652
		314-6655	*314-6665	314-6665	318-6725	*318-6726	*318-6730	*318-6734	325-6880	*328-6943
		328-6944	345-7232	*345-7237	*345-7241	345-7244	345-7250	*345-7265	347-7271	*347-7276
		*347-7280	347-7283	347-7289	*347-7317	349-7323	*349-7329	349-7330	349-7332	349-7360
		*349-7435	349-7436	352-7448	*352-7477	352-7481	*352-7488	352-7488	*352-7491	354-7497
		*354-7531	*354-7537	354-7537	*354-7544	354-7545	356-7551	*356-7561	*356-7565	356-7568
		356-7587	*356-7613	356-7614	356-7619	*356-7624	356-7625	356-7633	*356-7639	356-7639
		*356-7641	358-7646	*358-7680	*358-7686	358-7686	*358-7693	358-7694	368-68	368-83
		*368-83	370-103	*370-103	372-147	*372-147	374-166	*374-166	374-168	376-234
		*376-234	378-265	*378-265	380-305	*380-305	380-308	382-351	384-372	*384-372
		384-374	386-388	*386-388	386-390	388-435	*390-462	390-467	390-477	*390-518
		390-518	404-796	*404-797	404-798	*404-816	406-833	*406-834	406-835	*406-848
		408-930	*413-1074	*413-1097	413-1097	*415-1167	*415-1171	415-1171	*415-1174	*421-1248
		*421-1299	421-1299	*424-1313	*424-1363	424-1363	*426-1373	*426-1412	426-1412	*428-1421
		*428-1453	428-1453	*430-1463	*430-1501	430-1501	*434-1528	*434-1571	434-1571	*438-1619
		*438-1658	438-1658	*440-1680	*440-1711	440-1711	453-2040	458-2177	467-2382	467-2406
		469-2436	476-2599	476-2599	490-3021					
BANKIN	002110	#39-1153	*65-1741	65-1742	*65-1762	*68-1854	68-1902	*70-1964	70-2007	82-2220
		95-2566	314-6660	318-6728	318-6732	*325-6882	413-1092	415-1169	415-1176	434-1532
BANKMO	042072	82-2226	108-2830	314-6658	318-6723	#320-6767	336-7079			
BANKOK	042730	121-3016	123-3058	125-3107	127-3149	#328-6918				
BAWPAF	015434	100-2718	#116-2927	116-2955	116-2963					
BAWPAR	015572	100-2719	#118-2968	118-2996	118-3004					
BDSWIT	002500	#39-1257	*80-2183	561-4708						
BEGIN	005752	46-1414	48-1454	48-1455.	#59-1618					
BGTEST	035110	#270-5862	270-5883							
BIT0	000001	#12-315	65-1715	65-1735	80-2190	80-2191	282-6170	286-6254	286-6258	286-6263
		286-6268	291-6338	291-6340	294-6367	294-6372	294-6377	294-6383	297-6425	297-6427
		297-6433	297-6436	299-6460	299-6462	299-6473	299-6475	316-6711	316-6713	318-6743
		318-6745	341-7179	345-7246	347-7285	356-7570	360-7723	360-7729	376-221	386-423
		386-429	396-620	396-628	471-2482	475-2548				
BIT1	000002	#12-314	80-2191	80-2195	103-2768	134-3295	140-3425	294-6355	294-6361	294-6377
		294-6383	294-6390	294-6397	301-6489	301-6496				
BIT10	= 002000	#12-305	78-2147							
BIT11	= 004000	#12-304	68-1909	68-1928	90-2399	277-6016	314-6673	325-6904	396-621	396-627
		409-1007	417-1202	453-2042						
BIT12	= 010000	#12-303	61-1651	61-1652	61-1658	65-1747	65-1751	70-2008	95-2593	140-3434
		279-6140	314-6678	314-6678	325-6883	482-2717	482-2718	482-2734		
BIT13	= 020000	#12-302	61-1651	61-1658	65-1744	65-1751	70-1966	97-2631	97-2632	140-3435

SYMBOL	VALUE	REFERENCES								
		178-4309	178-4315	279-6118	303-6522	314-6662	314-6676	314-6677	314-6692	318-6733
		318-6737	318-6760	334-7047	362-7770	413-1094	482-2717	482-2734		
BIT14	= 040000	#12-301	37-1089	65-1745	68-1868	68-1881	68-1898	68-1920	70-1966	70-1969
		97-2631	97-2632	136-3332	147-3630	174-4225	176-4251	178-4284	183-4357	186-4391
		251-5564	251-5565	291-6345	291-6347	314-6676	314-6677	316-6699	318-6740	320-6791
		320-6807	325-6910	336-7087	345-7251	347-7291	347-7309	356-7602	362-7756	362-7769
		366-22	366-30	366-59	368-67	368-81	370-101	372-146	372-158	374-165
		374-169	374-190	376-232	378-263	378-280	380-304	380-312	380-333	384-371
		384-375	386-387	386-398	388-441	388-452	390-468	390-496	394-571	394-593
		396-608	396-622	399-670	399-674	402-756	402-760	404-799	406-836	408-925
BIT15	- 100000	#12-300	57-1579	57-1580	57-1603	82-2206	82-2221	84-2274	84-2285	84-2298
		136-3349	136-3361	136-3364	136-3368	163-3979	289-6284	289-6295	291-6337	291-6347
		299-6449	314-6661	314-6673	314-6674	316-6699	316-6706	318-6729	318-6740	320-6791
		320-6807	325-6898	366-60	380-306	399-670	402-760	413-1093	415-1170	415-1177
		417-1189	417-1217	455-2103	458-2190	469-2439	471-2478			
BIT2	= 000004	#12-313	80-2190	80-2192	84-2296	140-3425	282-6185	286-6268	294-6390	294-6397
		301-6489	301-6496	341-7179	360-7723	440-1670	478-2631	478-2633	478-2635	478-2638
		478-2640	478-2642							
BIT3	= 000010	#12-312	65-1752	78-2150	80-2193	80-2194	91-2456	140-3424	140-3428	279-6114
		286-6268	294-6356	294-6362	294-6378	294-6384	294-6391	294-6398	301-6490	301-6497
		341-7179	360-7723	434-1533	440-1670	478-2633	478-2635	478-2640	478-2642	
BIT4	- 000020	#12-311	65-1768	65-1769	80-2192	80-2194	91-2434	91-2468	108-2826	136-3349
		136-3368	291-6337	297-6414	297-6434	411-1038	413-1070	415-1113	415-1116	455-2103
		471-2478								
BIT5	- 000040	#12-310	53-1520	63-1679	80-2195	80-2196	108-2826	316-6702	316-6710	318-6747
		318-6750	334-7038	336-7081						
BIT6	= 000100	#12-309	80-2196	80-2197	274-5960	274-5993	349-7373	349-7430	352-7467	352-7473
		354-7523	354-7542	356-7596	356-7611	358-7672	358-7691	374-177		
BIT7	- 000200	#12-308	53-1523	80-2193	80-2197	274-5959	349-7372	352-7466	354-7522	356-7595
		358-7671	364-7777							
BIT8	- 000400	#12-307	65-1715	65-1746	90-2374	286-6268	341-7179	360-7723	386-423	386-429
BIT9	- 001000	#12-306	147-3647	147-3648	286-6254	286-6258	286-6268	316-6711	316-6713	318-6743
		318-6745	341-7179	360-7723	376-221	471-2482	475-2548			
BLOCK1	043710	68-1846	84-2286	103-2751	153-3786	153-3795	153-3806	155-3826	155-3843	155-3854
		163-3982	163-3987	163-3993	163-4000	163-4006	163-4012	165-4031	165-4034	165-4038
		165-4041	166-4077	168-4110	168-4115	170-4129	172-4184	176-4258	178-4306	241-5406
		271-5945	291-6323	#338-7102	370-133	376-237	376-243	378-292	378-295	380-302
		386-386								
BLOCK2	043730	#338-7107	374-170							
BLOCK3	043744	155-3822	155-3827	155-3828	155-3844	155-3855	166-4078	166-4079	168-4111	168-4112
		174-4226	178-4285	316-6700	318-6741	320-6792	320-6808	#338-7111	404-802	404-805
BMFLAG	002136	#39-1164	82-2210	116-2933	118-2974	123-3062	127-3153	314-6654	*325-6879	*325-6906
		*325-6909	413-1076							
BOOT	043416	#334-7024	488-2972	491-3092	509-3689					
BOOT1	043460	334-7033	#334-7039							
BRGOBB	035112	#270-5863	270-5867	270-5901						
CACHK	002700	#43-1315	286-6262	341-7179	*360-7723	*360-7729	440-1670	440-1670		
CACHOF	- 104424	#10-193	66-1810	68-1867	68-1880	68-1897	68-1919	70-1957	76-2083	84-2255
		93-2513	132-3249	136-3333	147-3631	183-4359	186-4393	251-5528	289-6290	291-6314
		291-6332	339-7134	360-7724	366-10	370-141	372-155	374-183	374-187	#376-257
		386-419	408-910	409-951	484-2757					
CACHON	104423	#10-192	48-1475	66-1813	68-1871	68-1884	68-1901	68-1924	70-2028	76-2107

SYMBOL	VALUE	REFERENCES								
		91-2508	93-2530	132-3257	136-3372	136-3379	147-3645	183-4361	186-4395	249-5504
		360-7730	398-645							
CACHVE	= 000114	#12-330	12-331							
CBCSR	= 104474	#10-236								
CB1CSR	= 104475	#10-237	147-3629	207-4716	210-4802	213-4893	218-4966	221-5044	224-5121	261-5709
CHECK	002404	#39-1223	*147-3627	294-6389	294-6396	*306-6551	561-4713			
CHKDIS	= 104504	#10-244	70-1971	70-1980	70-1988	70-1996				
CHKGEN	040540	207-4705	210-4793	213-4882	218-4954	221-5031	224-5109	259-5649	#306-6528	
CHKTAB	040640	306-6538	#308-6556							
CHK1DI	= 104505	#10-245	237-5291	237-5312	237-5320	239-5335	239-5356	239-5365	241-5381	241-5400
		394-585								
CKEND	073316	488-2953	488-2955	488-2957	#488-2986					
CKSWR	= 104410	#10-175	457-2134	460-2214	461-2255	484-2755				
CLRCSR	= 104502	#10-242	70-1974	70-1983	70-1991	70-1999	70-2013	#150-3658	170-4128	172-4199
		#349-7386	#352-7453	#354-7514	#356-7557	#358-7663	370-132	376-254		
CLR1CS	= 104503	#10-243	134-3293	136-3341	136-3359	136-3375	147-3634	147-3643	163-3981	163-4014
		207-4688	207-4733	207-4746	207-4777	210-4785	210-4804	210-4855	213-4862	213-4876
		213-4895	215-4924	218-4948	218-4970	218-5005	221-5025	221-5046	221-5082	224-5125
		226-5162	241-5411	259-5684	394-590					
CMD11A	047774	#358-7649	358-7653	358-7657						
CMD11B	050164	#358-7680	358-7688							
CMD11C	050240	358-7668	#358-7690							
CMD20A	050576	362-7746	#362-7768							
CMD5A	045456	#349-7349	349-7353	349-7357						
CMD5B	045666	#349-7381	349-7394							
CMD5C	046052	349-7365	349-7369	#349-7429						
CMD7A	046336	352-7463	#352-7472							
CMD8A	046550	#354-7500	354-7504	354-7508						
CMD8B	046740	#354-7531	354-7539							
CMD8C	047014	354-7519	#354-7541							
CMD9A	047240	#356-7573	356-7577	356-7581						
CMD9B	047456	356-7586	#356-7607							
CMD9C	047464	356-7592	#356-7610							
CMD9LO	047444	356-7585	#356-7603	356-7605	356-7607					
CONFGE	002576	#39-1288	*68-1910	*68-1929	95-2576	*95-2577	95-2617	*95-2618	97-2659	
CONFGT	006666	65-1705	#65-1767							
CONFG1	006304	#65-1707	65-1773							
CONFG3	006520	#65-1742	65-1765							
CONFG5	006712	65-1736	65-1766	#65-1772						
CONFIE	004336	#45-1398	51-1486							
CONFIG	003016	#45-1395	51-1484	*57-1579	*57-1580	*65-1743	*65-1744	*65-1745	*65-1747	*65-1752
		*65-1756	*65-1761	*66-1822	68-1859	*68-1909	*68-1911	*68-1928	*68-1932	70-1965
		70-1966	70-1966	*70-2008	*82-2206	*82-2221	95-2571	95-2579	95-2580	95-2581
		95-2582	95-2591	95-2593	95-2610	97-2630	97-2631	97-2632	97-2632	178-4309
		*178-4315	277-6016	277-6030	279-6051	279-6058	279-6090	279-6096	279-6113	279-6136
		279-6140	*303-6522	*314-6661	*314-6662	314-6673	314-6674	314-6675	314-6676	314-6677
		314-6677	314-6678	314-6678	*314-6692	*318-6729	*318-6733	*318-6737	325-6883	325-6888
		325-6893	325-6898	325-6904	325-6910	349-7334	356-7628	356-7634	*362-7756	*362-7769
		*362-7770	*413-1093	*413-1094	*415-1170	*415-1177	434-1533	*453-2042	*453-2044	*453-2046
		453-2047								
CONFSP	006754	*65-1706	65-1767	#65-1777						
CONTFL	002332	#39-1200	*100-2711	130-3203	*132-3278					

SYMBOL	VALUE	REFERENCES									
CONTP	073112	#488-2948	*509-3660	511-3708							
CONTRL	= 177746	#12-338	*46-1426	65-1704	*65-1775	*286-6262	*286-6263	*286-6268	289-6289	*289-6297	
		291-6313	*291-6317	291-6331	*291-6334	339-7133	*341-7182	*386-423	*386-429	*396-621	
		*396-627	398-644	*402-780	408-909	*408-945	484-2756	*484-2784	561-4714		
CONTS	073544	488-2951	#490-3033								
CONTS1	073052	#488-2938	490-3040								
CONTS2	073546	#490-3035	490-3036	490-3042							
CONTT	073404	480-2679	488-2943	#490-3007							
COREHI	043300	330-6957	330-6971	330-6984	332-7001	#332-7006	349-7367	349-7434			
COUNT	002462	#39-1250	*249-5505	249-5508	*249-5508	*249-5509	249-5510	*249-5517	*251-5526	251-5530	
		*251-5530	*251-5531	251-5532	*251-5551						
CPUBIT	002114	#39-1155	46-1407	*51-1490	59-1625	63-1665	63-1682	66-1822	68-1911	68-1932	
		70-1965	82-2205	84-2257	84-2261	84-2265	*90-2382	*91-2470	*91-2495	*91-2506	
		95-2563	*95-2572	*95-2574	97-2630	311-6640	314-6675	325-6888	349-7334	366-4	
		380-309	*390-463	*390-465	398-638	408-921	408-922	408-923	*411-1040	*411-1051	
		*411-1060	*413-1072	*413-1085	*415-1112	417-1195	*421-1249	*421-1251	*424-1314	*424-1316	
		*426-1374	*426-1376	*428-1422	*428-1424	*430-1464	*430-1466	*434-1529	*434-1531	*438-1620	
		*438-1622	*440-1681	*440-1683	457-2135	488-2931					
CPUERR	= 177766	#12-348	*51-1502	*51-1513	*57-1612	*61-1646	65-1768	*65-1774	*66-1823	*68-1874	
		*76-2098	*341-7194	*341-7198	*343-7210	*343-7227	*345-7266	*347-7318	*457-2158	*458-2195	
		*461-2277	561-4704	561-4709	561-4714						
CPUID	011656	84-2259	84-2263	84-2267	#84-2271						
CR	= 000015	#12-271	408-937								
CRLF	- 000200	#12-272	408-890	565-4782	569-4839	569-4840	569-4841	569-4842	569-4844	569-4846	
		569-4847	569-4848	569-4849	569-4850	569-4851	569-4857	569-4861	569-4862	569-4863	
		569-4864	569-4865	569-4866	569-4867	569-4868	569-4869	569-4870	569-4871	569-4872	
		569-4873	569-4874	569-4875	569-4876	569-4877	569-4878	569-4879	569-4880	569-4881	
		569-4882	569-4883	569-4885	569-4886	569-4887	569-4888	569-4889	569-4890	569-4891	
		569-4892	569-4893	569-4894	569-4895	569-4896	569-4897	569-4901	569-4903	569-4904	
		569-4905	569-4906	569-4907	569-4908	569-4909	569-4910	569-4911	569-4912	569-4913	
		569-4913	569-4914	569-4916	569-4917	569-4918	569-4919	569-4920	569-4922	569-4923	
		569-4924	569-4926	569-4927	569-4928	569-4932	569-4934	569-4938	569-4939	569-4940	
		569-4941	569-4944	569-4945	569-4945	569-4946	569-4947	569-4948	569-4949	569-4950	
		569-4952	569-4953	569-4954	569-4955	569-4956	569-4959	569-4960	569-4961	569-4967	
		569-4968	569-4969	569-4972	569-4973	569-4974	569-4975	569-4976	569-4976	569-4978	
		569-4979	569-4980	569-4981	569-4982	569-4983	569-4984	569-4985			
CSR	002144	#39-1167	65-1712	65-1731	65-1732	65-1751	*70-1968	*70-1979	*70-1987	*70-1995	
		*78-2142	*78-2143	*78-2145	*78-2146	*78-2147	*78-2149	*78-2149	*78-2150	78-2153	
		*93-2549	*93-2550	134-3295	136-3349	136-3368	138-3396	*140-3424	*140-3425	*140-3428	
		140-3429	140-3432	147-3637	150-3672	150-3673	237-5283	237-5284	*237-5290	237-5304	
		237-5306	*237-5311	*237-5319	239-5326	*239-5334	239-5348	239-5350	*239-5355	*239-5364	
		241-5372	*241-5380	241-5391	241-5393	*241-5399	289-6280	289-6282	289-6291	289-6293	
		*291-6309	*291-6310	*291-6315	*291-6316	291-6337	291-6337	*291-6348	*291-6349	*294-6355	
		*294-6356	*294-6357	*294-6361	*294-6362	*294-6363	*294-6367	*294-6368	*294-6372	*294-6373	
		*294-6377	*294-6378	*294-6379	*294-6383	*294-6384	*294-6385	*294-6389	*294-6390	*294-6391	
		*294-6392	*294-6396	*294-6397	*294-6398	*294-6399	297-6414	297-6434	299-6449	299-6468	
		299-6470	*301-6480	*301-6480	*301-6484	*301-6484	*301-6489	*301-6490	*301-6491	*301-6496	
		*301-6497	*301-6498	*343-7213	*343-7216	394-587	399-685	399-685	*401-739	*401-739	
		455-2103	471-2474	471-2474	471-2478	471-2479	471-2482	*471-2495	*471-2495	480-2682	
		480-2682	480-2691	480-2693	*480-2699	*480-2699	561-4711	561-4711	561-4712	561-4712	
		561-4713	561-4713								
CSRCAS	020114	132-3255	#143-3448								

SYMBOL VALUE REFERENCES

CSRFB 002214 #39-1171 *65-1733 476-2595
CSRFBA 002410 #39-1225 132-3264 *138-3392 *145-3505 *145-3521 *145-3537 *145-3553 *145-3581 *145-3597
*145-3613
CSRFIR 002336 #39-1207 132-3246 *145-3499 *145-3507 *145-3509 *145-3515 *145-3523 *145-3525 *145-3531
*145-3539 *145-3541 *145-3547 *145-3555 *145-3557 *145-3575 *145-3583 *145-3585 *145-3591
*145-3599 *145-3601 *145-3607 *145-3615 *145-3617 147-3628 163-3975 163-3999 237-5285
349-7323 *349-7382 *349-7433
CSRINC 002414 #39-1227 132-3261 *145-3501 *145-3511 *145-3517 *145-3527 *145-3533 *145-3543 *145-3549
*145-3559 *145-3577 *145-3587 *145-3593 *145-3603 *145-3609 *145-3619 *163-3964 163-3977
237-5286
CSRIND 002416 #39-1228 *132-3229 132-3232 *132-3274
CSRLB 002234 #39-1172 *65-1738 476-2596
CSRLBA 002412 #39-1226 132-3238 *138-3393
CSRLOO 002420 #39-1230 *132-3231 132-3267 *132-3276 132-3276 134-3297
CSRNO 002256 #39-1174 *65-1703 65-1729 65-1749 *65-1772 65-1773 *78-2138 *78-2161 78-2161
*93-2551 *93-2556 93-2556 *134-3292 *163-3958 289-6277 291-6306 291-6325 *297-6410
*297-6420 297-6420 *299-6445 *299-6455 299-6455 *303-6507 *303-6513 303-6513 339-7133
*341-7178 352-7448 *352-7491 *364-7779 *364-7791 398-648 *399-681 *399-688 399-688
*401-736 *401-743 401-743 *402-776 471-2474 *471-2475 *471-2495 476-2588 *476-2625
480-2682 *480-2687 *480-2697 480-2697 *480-2699 561-4709
CSROUD 002417 #39-1229 *132-3230 *132-3275 134-3287
CSROUT 040442 294-6358 294-6369 294-6380 294-6393 301-6481 301-6492 #303-6503
CSRREL 002254 #39-1173 *61-1640 *61-1645 289-6278 291-6307 291-6326
CSRO 002154 #39-1169 *65-1731
CSR2 002174 #39-1170 *65-1732 476-2600
DATBUF 002340 #39-1208 *199-4553 *199-4554 199-4555 199-4556 199-4558 199-4563 199-4567 *199-4569
*199-4569 *199-4572 *199-4573 199-4574 199-4575 199-4577 199-4582 199-4586 *199-4588
*199-4588 *207-4690 *207-4691 207-4696 207-4697 207-4765 *207-4767 *207-4767 *210-4786
*210-4787 210-4790 210-4791 210-4847 *210-4849 *210-4849 *213-4864 *213-4865 213-4870
213-4871 *218-4936 *218-4937 218-4942 218-4943 *221-5013 *221-5014 221-5019 221-5020
*224-5092 *224-5093 224-5098 224-5099 446-1919 446-1924
DBEMSK 002354 #39-1211 *213-4868 *213-4869 213-4877 213-4879 213-4887 213-4889 215-4906 *215-4908
*215-4908 *218-4940 *218-4941 218-4949 218-4951 218-4959 218-4961 218-4987 *218-4989
*218-4989 *221-5017 *221-5018 221-5026 221-5028 221-5036 221-5038 221-5064 *221-5066
*221-5066 *224-5096 *224-5097 224-5104 224-5106 224-5114 224-5116 226-5144 *226-5146
*226-5146
DDISP - 177570 #12-265 43-1347 51-1497
DECMAR 043152 114-2907 118-2984 125-3117 127-3161 #330-6976
DEENER = 104421 #10-188 61-1648 334-7037 336-7080
DETAIL 071364 465-2360 #478-2645 478-2674
DETFLA 002326 #39-1196 461-2262 465-2359 *478-2646 478-2647 478-2649 *482-2749
DETPSW 002324 #39-1195 561-4710
DETR0 002306 #39-1188 *478-2654 478-2663 561-4710
DETR1 002310 #39-1189 478-2655 561-4710
DETR2 002312 #39-1190 561-4710
DETR3 002314 #39-1191 561-4710
DETR4 002316 #39-1192 561-4710
DETR5 002320 #39-1193 561-4710
DETSP 002322 #39-1194 561-4710
DF1 102740 #563-4729
DF10 103076 551-4513 #563-4738
DF11 103103 549-4421 551-4488 551-4493 551-4498 553-4520 553-4525 553-4540 557-4649 557-4654

SYMBOL	VALUE	REFERENCES								
		#563-4739								
DF12	103114	555-4622	#563-4740							
DF13	103116	553-4555	553-4570	555-4587	557-4634	557-4639	557-4679	#563-4741		
DF14	103125	559-4696	#563-4742							
DF2	102743	549-4426	549-4441	549-4446	549-4451	549-4456	551-4473	551-4503	553-4530	553-4535
		553-4545	553-4550	555-4577	555-4627	557-4644	557-4664	557-4669	557-4674	559-4691
		#563-4730								
DF3	102767	551-4463	553-4565	555-4592	555-4597	555-4607	555-4612	555-4617	557-4684	#563-4731
DF4	103004	551-4468	#563-4732							
DF5	103021	551-4478	551-4508	555-4602	#563-4733					
DF6	103036	551-4483	#563-4734							
DF7	103053	553-4560	#563-4735							
DF8	103067	555-4582	#563-4736							
DF9	103071	549-4431	549-4436	#563-4737						
DH1	107366	549-4424	549-4454	#567-4807						
DH10	110145	551-4471	#567-4818							
DH11	110243	551-4501	553-4533	#567-4819						
DH12	110272	553-4528	#567-4820							
DH13	110307	549-4419	551-4486	551-4491	551-4496	553-4518	553-4523	553-4538	#567-4821	
DH14	110415	553-4543	#567-4823							
DH15	110533	553-4558	#567-4825							
DH16	110655	553-4563	555-4580	557-4682	#567-4827					
DH17	110672	553-4553	553-4568	555-4585	557-4632	557-4637	557-4677	#567-4828		
DH18	110746	557-4647	557-4652	#567-4829						
DH19	111023	555-4620	#567-4830							
DH2	107423	557-4642	#567-4808							
DH20	111037	557-4662	557-4672	#567-4831						
DH21	111056	557-4667	#567-4832							
DH22	111063	559-4689	#567-4833							
DH23	111111	559-4694	#567-4834							
DH3	107446	549-4429	549-4434	#567-4809						
DH4	107502	#567-4810								
DH5	107507	549-4439	549-4444	549-4449	553-4548	#567-4811				
DH6	107615	555-4625	#567-4813							
DH7	107664	551-4461	551-4466	551-4476	551-4481	551-4506	555-4590	555-4595	555-4600	555-4605
		555-4610	555-4615	#567-4814						
DH8	110006	551-4511	#567-4816							
DH9	110106	555-4575	#567-4817							
DIAGFL	002006	#39-1118	*165-4059	*165-4061	249-5522					
DISPLA	002770	#43-1347	*51-1497	*51-1504	356-7604	366-34	376-223	390-461	402-774	409-954
		411-1035	413-1067	415-1180	421-1244	424-1309	426-1372	428-1420	430-1462	432-1524
		438-1618	440-1675	442-1720	458-2192					
DISPRE	= 000174	#14-549	51-1504	*402-775	*458-2193					
DISPTB	014370	100-2714	#100-2716							
DNSLAV	055170	#398-639	398-640							
DOBACK	015104	99-2708	103-2729	105-2781	#110-2843	415-1182				
DSWR	= 177570	#12-264	43-1346	51-1496						
DT1	102252	549-4425	549-4455	#561-4700						
DT10	102444	551-4472	#561-4710							
DT11	102466	551-4502	553-4534	#561-4711						
DT12	102476	553-4529	#561-4712							
DT13	102504	549-4420	551-4487	551-4492	551-4497	553-4519	553-4524	553-4539	#561-47?3	

SYMBOL VALUE REFERENCES

DT14 102530 553-4544 #561-4714
DT16 102556 553-4559 #561-4715
DT17 102610 553-4564 555-4581 557-4683 #561-4717
DT18 102616 553-4569 557-4633 557-4638 #561-4718
DT19 102634 555-4586 #561-4719
DT2 102264 553-4554 557-4678 #561-4701
DT20 102652 557-4643 559-4690 #561-4720
DT21 102662 557-4648 557-4653 #561-4721
DT22 102700 555-4621 #561-4722
DT23 102706 557-4663 557-4673 #561-4723
DT24 102714 557-4668 #561-4724
DT25 102720 559-4695 #561-4725
DT3 102302 549-4430 #561-4702
DT4 102312 549-4435 #561-4703
DT5 102322 549-4440 549-4445 549-4450 553-4549 #561-4704
DT6 102346 555-4626 #561-4705
DT7 102362 551-4462 551-4467 551-4477 551-4482 551-4507 555-4591 555-4596 555-4601 555-4606
555-4611 555-4616 #561-4706
DT8 102416 551-4512 #561-4708
DT9 102432 555-4576 #561-4709
DUMMY 002304 #39-1186 561-4701 561-4706 561-4706 561-4707 561-4707 561-4707 561-4707 561-4707
561-4707 561-4713 561-4713 561-4715 561-4715 561-4716 561-4716 561-4716 561-4717
561-4718 561-4719 561-4721 561-4721 561-4722 561-4725
ECCDIS = 104470 #10-232 70-2010 150-3656 172-4185 349-7384 352-7451 354-7512 356-7555 358-7661
ECCINI = 104472 #10-234 66-1795 #66-1829 #70-2025 132-3277 150-3676 172-4202 172-4209 172-4213
334-7032 336-7071
ECC1DI = 104471 #10-233 136-3334 136-3351 147-3640 207-4714 207-4721 207-4774 210-4800 210-4852
213-4891 215-4921 218-4964 218-5002 221-5041 221-5078 224-5119 226-5158 241-5409
259-5689 261-5697 261-5707
ECC1IN = 104473 #10-235 136-3371 136-3378 259-5654 261-5700
EMTVEC = 000030 #12-325 *48-1459 *48-1460
EM1 103134 557-4656 #565-4752
EM10 103633 549-4453 #565-4762
EM11 103677 551-4460 551-4465 551-4475 551-4480 #565-4763
EM12 103721 551-4470 #565-4764
EM13 103745 551-4485 #565-4765
EM14 103777 551-4490 #565-4766
EM15 104043 551-4495 #565-4767
EM16 104111 551-4500 #565-4768
EM17 104137 551-4505 #565-4769
EM18 104177 551-4510 #565-4770
EM19 104256 553-4517 #565-4771
EM2 103220 549-4423 #565-4753
EM20 104333 553-4522 #565-4772
EM21 104415 553-4532 #565-4773
EM22 104454 553-4537 #565-4774
EM23 104501 553-4547 #565-4775
EM24 104530 549-4418 #565-4776
EM25 104607 553-4557 #565-4777
EM26 104634 553-4562 #565-4778
EM27 104705 555-4579 #565-4779
EM28 104774 555-4584 #565-4780

SYMBOL		VALUE	REFERENCES								
EM29		105027	555-4594	#565-4781							
EM3		103256	549-4428	#565-4754							
EM30		105111	555-4599	#565-4782							
EM31		105230	555-4604	#565-4784							
EM32		105330	555-4609	#565-4785							
EM33		105435	555-4614	#565-4786							
EM34		105543	555-4619	#565-4787							
EM35		105624	555-4589	#565-4788							
EM36		105711	555-4624	#565-4789							
EM37		105760	557-4631	#565-4790							
EM38		106025	553-4552	#565-4791							
EM39		106133	557-4636	#565-4792							
EM4		103311	549-4433	#565-4755							
EM40		106220	557-4641	#565-4793							
EM41		106272	557-4646	#565-4794							
EM42		106374	557-4651	#565-4795							
EM43		106477	557-4661	#565-4796							
EM44		106575	557-4666	#565-4797							
EM45		106672	557-4671	#565-4798							
EM46		106773	557-4676	#565-4799							
EM47		107062	557-4681	#565-4800							
EM48		107170	559-4688	#565-4801							
EM49		107267	559-4693	#565-4802							
EM5		103357	549-4438	#565-4756							
EM6		103434	549-4443	#565-4757							
EM7		103461	549-4448	#565-4758							
EM8		103521	553-4567	#565-4759							
EM9		103556	555-4574	#565-4761							
ENASBE	=	104506	#10-246	66-1827	70-2023						
ENA1SB	=	104507	#10-247	259-5658	259-5691	261-5702					
END		117144	46-1430	#569-4997	569-5007	569-5008					
ENERGI	-	104420	#10-187	63-1686	108-2827	417-1215	419-1236				
ERRMAX		002702	#43-1316	453-2047							
ERROR	-	104000	#12-259	65-1770	66-1817	66-1821	72-2038	80-2184	90-2395	91-2448	91-2485
			93-2521	#95-2583	95-2619	99-2695	99-2704	103-2758	105-2775	210-4815	213-4902
			259-5663	261-5720	261-5731	282-6197	284-6224	284-6228	284-6231	284-6234	299-6472
			341-7193	343-7209	343-7223	366-28	386-409	386-417	390-485	390-511	390-531
			392-550	394-600	409-976	409-1002	409-1019	411-1052	413-1086	413-1099	417-1197
			421-1268	421-1290	424-1332	424-1354	426-1404	428-1445	430-1481	430-1495	436-1592
			436-1606	438-1639	438-1652	440-1704	442-1729	449-1994	#449-1996	449-2006	#449-2008
			451-2017	453-2067	453-2070	453-2073	453-2076	455-2087	455-2098	455-2104	#455-2106
			455-2115	478-2665	478-2671	484-2778					
ERRPC		002024	#39-1128	*460-2228	*460-2229	460-2232	*460-2235	*460-2236	460-2241	463-2295	561-4700
			561-4701	561-4702	561-4703	561-4704	561-4705	561-4706	561-4709	561-4711	561-4713
			561-4715	561-4717	561-4718	561-4719	561-4720	561-4721	561-4722	561-4723	561-4724
			561-4725								
ERRPSW		002034	#39-1132	*460-2231	*460-2238	478-2662					
ERRSP		002030	#39-1130	*460-2230	*460-2237	478-2661					
ERRVEC	=	000004	#12-318	*48-1469	*48-1470	457-2152	*457-2153	*457-2155	*457-2159		
EVEN		002456	#39-1248	*249-5493	249-5494	*251-5557	251-5557				
EXBANK		042423	72-2035	76-2112	78-2128	82-2209	82-2217	95-2565	95-2573	95-2589	103-2753
			110-2846	112-2862	114-2896	116-2930	118-2971	121-3015	123-3057	125-3106	127-3148

SYMBOL	VALUE	REFERENCES								
		132-3239	132-3280	170-4135	170-4158	172-4188	172-4207	314-6653	318-6727	318-6731
		#325-6861	349-7362	349-7437	352-7478	354-7532	354-7546	356-7615	358-7681	358-7695
		390-464	413-1075	415-1168	415-1175	421-1250	424-1315	426-1375	428-1423	430-1465
		434-1530	438-1621	440-1682						
EXCMD3	044726	345-7255	345-7258	345-7262	#345-7264					
EXCMD4	045236	347-7298	347-7302	#347-7316						
EXIT	043522	#336-7053	457-2143	461-2265						
EXIT2	043526	#336-7055								
FASTCI	= 177640	#12-378	68-1869	68-1899	84-2291	155-3824	183-4360	241-5410	291-6328	291-6333
		338-7103	386-399							
FATAL$	002070	#39-1145	*66-1817	*66-1821	*259-5663	*282-6197	*284-6224	*284-6228	*284-6231	*366-28
		461-2263	463-2308							
FCMD10	047550	339-7154	#356-7618							
FCMD11	047734	339-7155	#358-7645							
FCMD12	050330	339-7156	#360-7700							
FCMD13	050356	339-7157	#360-7710							
FCMD14	050400	339-7158	#360-7715							
FCMD15	050420	339-7159	#360-7721							
FCMD16	050436	339-7160	#360-7727							
FCMD17	050454	339-7161	#360-7733							
FCMD18	050470	339-7162	#362-7739							
FCMD19	050502	339-7163	#362-7744							
FCMD20	050566	339-7164	#362-7763							
FIELDS	043774	#339-7124	488-2940	511-3699						
FIRST	060000	#14-556	68-1862	68-1891	68-1917	70-1959	70-1970	70-1970	*70-2014	*70-2014
		103-2749	145-3499	145-3507	145-3509	145-3515	145-3523	145-3525	145-3531	145-3539
		145-3541	145-3547	145-3555	145-3557	145-3575	145-3583	145-3585	145-3591	145-3599
		145-3601	145-3607	145-3615	145-3617	153-3783	153-3791	153-3804	155-3815	155-3841
		155-3852	157-3871	165-4030	166-4074	168-4107	170-4139	170-4162	172-4192	174-4226
		174-4231	174-4232	176-4248	176-4264	176-4268	178-4285	178-4288	178-4289	178-4290
		178-4291	178-4299	229-5174	241-5407	249-5506	251-5527	251-5561	251-5563	251-5564
		271-5943	*336-7088	*336-7089	*336-7090	345-7245	347-7284	349-7382	352-7482	356-7569
		366-23	366-31	366-33	366-35	*366-60	368-68	368-82	368-83	368-86
		370-102	370-103	370-106	372-147	372-151	*372-159	374-166	374-170	374-179
		374-181	*374-191	376-233	376-234	376-238	376-246	378-264	378-265	378-281
		378-291	380-305	*380-306	380-310	380-313	380-319	*382-350	*382-352	384-372
		384-376	384-377	386-388	386-391	386-392	386-408	386-416	388-436	*390-469
		390-494	390-514	*392-558	404-800	404-801	404-802	*404-803	*404-804	404-805
		404-807	*406-837	*406-838	406-843	408-926	*408-928	*408-929	426-1381	426-1384
		469-2435								
FIRSTB	002260	#39-1175	65-1733	65-1734	65-1739	*65-1763	65-1764	138-3392	*140-3438	140-3439
		140-3441	*140-3441	145-3505	145-3521	145-3537	145-3553	145-3581	145-3597	145-3613
		*476-2595	476-2599							
FLIPLO	002734	#43-1329	*48-1445	155-3831	*271-5915	*271-5916	271-5917	271-5919	271-5921	
FLIPWA	035214	155-3814	#271-5913							
FLUSH	014656	#105-2784	415-1184							
FSCMD0	044170	#339-7144	#341-7169							
FSCMD1	044256	339-7145	#341-7187							
FSCMD2	044346	339-7146	#343-7202							
FSCMD3	044520	339-7147	#345-7231							
FSCMD4	044764	339-7148	#347-7270							
FSCMD5	045274	339-7149	#349-7322							

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SYMBOL CROSS REFERENCE CREF V01 SEQ 1091

SYMBOL	VALUE	REFERENCES								
FSCMD6	046152	339-7150	#349-7440							
FSCMD7	046160	339-7151	#352-7447							
FSCMD8	046510	339-7152	#354-7496							
FSCMD9	047104	339-7153	#356-7550							
FSINFL	002542	#39-1274	*108-2797	145-3568	*145-3569					
FSPAT	045752	349-7392	#349-7396							
FSSTAC	002374	#39-1219	*341-7189	341-7197	*343-7204	343-7226	*349-7325	349-7429	*352-7468	352-7472
		*354-7498	354-7541	*356-7552	356-7610	*358-7647	358-7690			
FS1	044052	#339-7136	339-7142	339-7166						
FS7FLA	002546	#39-1276	170-4152	*352-7449	*352-7490					
GBLENG	= 000076	178-4285	178-4288	#270-5902						
GDSWIT	002476	#39-1256	*80-2179	561-4708						
GETDAT	055030	#396-614	449-1990	449-2002						
GETDA1	055156	*396-616	396-626	#396-631						
GETDIS	066514	183-4336	186-4370	457-2172	#458-2176	460-2217				
GETSIZ	017736	65-1727	138-3391	#140-3421						
GOOD	002050	#39-1137	*65-1769	*80-2175	*99-2702	*386-406	*386-414	*394-576	*394-578	*394-592
		*396-605	*446-1886	*446-1892	*446-1897	*446-1904	*446-1907	*446-1914	*446-1919	*446-1924
		*446-1929	*446-1934	*448-1940	*448-1945	*448-1950	*448-1955	*448-1960	*448-1965	*448-1970
		*448-1975	*448-1980	*448-1985	451-2030	*453-2056	*453-2058	*455-2085	*455-2095	*455-2114
		561-4700	561-4706	561-4708	561-4715	561-4720	561-4721			
GOOD2	002052	#39-1138	*451-2020	*451-2024	561-4715					
GOOD3	002054	#39-1139	*451-2021	*451-2025	561-4715					
GTSWR	104407	#10-174	63-1667							
HEADER	002724	#43-1325	*48-1446	*103-2734	*103-2736	*110-2848	*110-2851	*130-3197	*130-3210	*132-3252
		*207-4741	*207-4744	*207-4755	*207-4758	*210-4813	*210-4816	*210-4827	*210-4830	*213-4900
		*213-4903	*261-5721	*261-5732	*349-7380	*354-7529	*358-7678	*453-2061	*453-2078	*455-2086
		*455-2088	*455-2097	*455-2099	*461-2275	463-2306	463-2318	*465-2357	478-2651	*478-2652
		478-2667	*478-2668	*478-2672						
HIACBA	002514	#39-1263	*78-2124	*78-2131	78-2135	78-2143				
HIADRS	177742	#12-336	561-4704	561-4714						
HIBANK	002512	#39-1262	*76-2120							
HIPAT	042762	125-3102	127-3144	#328-6937						
HT	000011	#12-269	408-887							
HUNGMS	002572	#39-1286	*91-2441	*91-2445	*91-2477	*91-2482	*411-1044	*411-1048		
HUNGTI	002574	#39-1287	*90-2391	*91-2442	*91-2478	*390-481	*390-527	*409-972	*409-999	*409-1015
		*411-1045	*413-1081	*417-1193	*421-1264	*421-1286	*424-1328	*424-1350	*426-1400	*428-1441
		*430-1477	*436-1602	*438-1635	*440-1700	*442-1725	*484-2785			
I	002602	#39-1290	*55-1568	*55-1574	55-1574	*97-2650	*97-2650	97-2651	*97-2651	97-2653
		*132-3250	132-3254	*132-3256	132-3256	*170-4133	170-4143	170-4146	*170-4151	170-4151
		*170-4156	170-4166	170-4169	*170-4174	170-4174	*380-311	*380-318	380-318	*390-495
		*390-513	390-513	*434-1537	434-1539	*434-1568	434-1568	436-1581	436-1589	436-1591
IISTAC	002736	#43-1330	57-1603	57-1604	84-2274	84-2275	84-2295	90-2392	90-2403	91-2418
		366-18	408-915	409-994	409-1000	417-1189	417-1190	417-1194	417-1209	
IISTAD	002740	#43-1331	57-1608	84-2296	90-2399	90-2404	90-2405	91-2419	91-2420	409-995
		409-996	409-1007	417-1191	417-1192	417-1202	417-1210			
IISTIN	061074	84-2293	#417-1187	417-1208						
IISTOF	061174	90-2402	409-993	#417-1207						
IISTVE	002742	#43-1332	90-2386	91-2464	380-303	380-316	382-341	382-342	382-343	382-343
		382-346	382-347	382-347	384-358	392-563	409-985			
IITRAP	036764	48-1473	91-2464	#284-6233						
INCBNK	042772	112-2879	114-2913	116-2949	118-2990	121-3029	123-3073	125-3120	127-3164	#328-6941

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SYMBOL  VALUE          REFERENCES
INCMAR    043006        112-2873   116-2943   121-3026   123-3070   #330-6948
INCPAT    042746        112-2876   116-2946   #328-6929
INCRPT    042746        121-3032   123-3076   #328-6928
INTERL    002264       #39-1177    *65-1726    65-1743
INTER0    006756       #65-1717    #65-1780
INTER1    006760        65-1718    #65-1782
INTER2    006760        65-1719    #65-1783
INTER3    006766        65-1720    #65-1786
INTER4    006766        65-1721    #65-1787
INTER5    006774        65-1722    #65-1791
INTER6    006766        65-1723    #65-1788
INTER7    006774        65-1724    #65-1792
INTKRA    017610        132-3235   #138-3384  163-3962
INT..0    020234       #138-3400   #145-3499
INT..1    020260        138-3401   #145-3505  145-3572
INT..2    020324        138-3402   #145-3515
INT..3    020350        138-3403   #145-3521
INT..4    020414        138-3404   #145-3531
INT..5    020440        138-3405   #145-3537
INT..6    020504        138-3406   #145-3547
INT..7    020530        138-3407   #145-3553
INT.10    020574        138-3408   #145-3564
INT.11    020574        138-3409   #145-3568
INT.12    020616        138-3410   #145-3575
INT.13    020642        138-3411   #145-3581
INT.14    020706        138-3412   #145-3591
INT.15    020732        138-3413   #145-3597
INT.16    020776        138-3414   #145-3607
INT.17    021022        138-3415   #145-3613
INVALI  - 104511       #10-249     132-3242   150-3665   152-3731   170-4137   332-7016   347-7290   349-7361   352-7480
                        354-7534    356-7588   358-7683   413-1077   421-1253
IOTVEC  - 000020       #12-323     *48-1457   *48-1458
ISECCO    017300        132-3233   #134-3284
J         002604       #39-1291    *434-1538  434-1539   434-1540   434-1543   *434-1549  434-1549
KAMIKA    002010       #39-1119    180-4326   339-7133   *339-7135  *341-7176  *360-7712  *360-7717
KAMITE    026006        165-4047   165-4055   166-4065   174-4219   176-4239   178-4277   #180-4325
KDIAG   = 000010       #249-5492   249-5508   251-5530   251-5556
KDPAR0  - 172360       #12-469     155-3827   155-3844   155-3855   166-4079   168-4111   192-4478   196-4517   196-4539
                        256-5632   264-5739   264-5748
KDPAR7  = 172376       #12-476
KDPDR7    172336       #12-456
KERNEL    104417       #10-185     68-1870    68-1883    68-1900    68-1923    70-2015    136-3370   136-3377   147-3644
                        174-4227   176-4259   178-4286   183-4362   186-4396   316-6701   318-6742   320-6793   320-6809
                        336-7091   345-7253   345-7264   347-7294   347-7312   347-7316  #366-24     365-36     366-61
                        368-69     368-84     370-104    372-148    372-160    374-167    374-171    374-192    376-235
                        378-266    378-282    380-307    380-320    384-373    384-381    386-389    386-401    388-450
                        388-454    390-470    390-515    394-573    394-596    396-610    396-624    399-672    399-676
                        402-758    402-762    404-815    406-847    408-931
KERSTK  - 002000       #12-256
KIPAR0  = 172340       #12-459     82-2232    311-6605   311-6630   322-6817   322-6837   404-806    406-822    419-1225
KIPAR4    172350       #12-463     322-6851
KIPAR5    172352       #12-464
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SYMBOL	VALUE	REFERENCES								
KIPAR6	= 172354	#12-465								
KIPAR7	= 172356	#12-466								
KIPDR0	= 172300	#12-439	311-6632	322-6819	398-661	401-725	401-746	406-823	419-1227	
KI0	002550	#39-1277	82-2233	419-1224						
KI1	002552	#39-1278								
KI2	002554	#39-1279								
KI3	002556	#39-1280								
KI4	002560	#39-1281								
KI5	002562	#39-1282								
KI6	002564	#39-1283								
KI7	002566	#39-1284								
KMAP	- 104422	#10-190	63-1683							
KPFLAG	002122	#39-1158	*70-1958	72-2037	82-2211	294-6356	294-6362	294-6378	294-6384	294-6391
		294-6398	301-6490	301-6497	*325-6877	*325-6885				
KSTACK	002706	#43-1318	46-1406	57-1611	*90-2378	90-2379	*91-2471	*91-2507	108-2825	**368-71
		368-73	*409-962	*409-978	*409-990	*409-1004	*409-1021	*409-1028	*413-1105	417-1213
		482-2707								
LAST	- 157776	#14-557	132-3261	153-3800	163-3980	165-4028	166-4075	176-4249	176-4263	229-5176
		237-5289	249-5507	251-5529	251-5565	266-5805	270-5893	345-7247	347-7286	356-7571
		376-244	388-437	426-1384						
LASTB	002262	#39-1176	65-1738	65-1764	138-3393	*140-3431	*140-3434	*140-3435	*140-3439	*140-3440
		140-3442	*140-3442	*476-2596	476-2599					
LASTER	002020	#39-1126	*80-2185	105-2774	*108-2798					
LF	000012	#12-270	408-941							
LKS	= 177546	#12-266	51-1510	*374-177	*374-184					
LOADBA	002532	#39-1270	*314-6656	318-6721	318-6726					
LOADCS	- 104425	#10-195	78-2148	78-2151	93-2554	140-3426	294-6364	294-6374	294-6386	294-6400
		301-6485	301-6499	303-6510	343-7218	401-740				
LOADHO	002710	#43-1319	*82-2219	82-2222	82-2224	108-2828	311-6641	314-6657	318-6722	318-6730
		336-7078	415-1174							
LOADRS	- 177740	#12-335	282-6176	561-4704	561-4714					
LOCK	002670	#41-1307	*46-1436	46-1437	*57-1614	*59-1620	59-1621	*78-2157	*84-2287	*84-2299
		*90-2368	*91-2501	91-2502	*336-7082	*409-961	*409-989	*411-1036	*413-1068	*415-1183
LOOP	014342	#100-2710	108-2840							
LOWMAP	042026	63-1678	316-6709	318-6749	#318-6754	401-722				
LST$$	- 000000	#1-1								
MAINT	- 177750	#12-339	*63-1672	*103-2768	*130-3196	*170-4127	*172-4182	*332-7012	*334-7034	*336-7072
		*349-7378	*354-7527	*356-7600	*358-7676	*370-131	*374-193	*376-253	*384-366	*396-620
		*396-628	398-644	*402-780	458-2182	490-3023	561-4714			
MAPH0	170202	#14-484	*63-1677	*316-6708	*318-6748	399-698	*401-721			
MAPH36	= 170372	#14-544	*63-1675	*76-2084	*76-2091	76-2092	*76-2097	*76-2101	76-2102	*76-2105
		399-698	*401-721							
MAPH37	= 170376	#14-546								
MAPL0	= 170200	#14-483	*63-1677	*316-6706	*318-6748	318-6756	399-698	*401-721		
MAPL1	= 170204	#14-485	318-6757							
MAPL36	= 170370	#14-543	*63-1676	*76-2085	*76-2090	*76-2096	*76-2100	*76-2106	399-698	*401-721
MAPPER	040700	63-1685	68-1858	70-1967	70-2019	132-3241	174-4224	176-4244	178-4282	183-4335
		186-4369	#311-6604	336-7086	345-7250	347-7289	349-7360	349-7436	354-7545	356-7587
		356-7614	358-7694	366-11	366-58	368-75	372-156	374-168	374-188	380-308
		382-349	382-351	384-374	386-390	388-435	390-467	390-477	404-798	406-835
		408-924	408-930							
MARGIN	002112	#39-1154	*112-2869	*116-2939	*121-3022	*123-3066	130-3194	*170-4127	*172-4182	330-6955

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SYMBOL	VALUE	REFERENCES								
		*330-6956	330-6959	*330-6960	330-6961	*330-6963	330-6964	330-6967	*330-6970	330-6972
		330-6979	*330-6980	330-6981	*330-6983	330-6985	332-6995	*332-6997	*332-6999	*332-7003
		332-7008	332-7009	332-7009	332-7010	349-7323	349-7324	*349-7351	349-7352	349-7352
		349-7355	349-7375	*349-7433	352-7448	*352-7491	354-7497	*354-7502	354-7503	354-7503
		354-7506	354-7525	*354-7544	356-7551	*356-7575	356-7576	356-7576	356-7579	356-7598
		*356-7613	358-7646	*358-7651	358-7652	358-7652	358-7655	358-7674	*358-7693	*370-131
		*374-193	*376-253	*384-367	469-2448					
MASTER	000020	#14-561	46-1407	51-1490	59-1625	63-1665	63-1682	82-2205	90-2380	91-2495
		91-2496	91-2506	95-2563	95-2571	95-2574	95-2579	279-6096	311-6640	325-6886
		366-4	380-309	390-465	398-638	411-1051	411-1060	413-1085	415-1112	417-1195
		421-1251	424-1316	426-1376	428-1424	430-1466	434-1531	438-1622	440-1683	457-2135
		488-2931								
MAST01	057372	105-2783	#409-949							
MAST02	060046	#411-1032								
MAST03	060220	#413-1064								
MAST04	061322	415-1118	#421-1241							
MAST05	061706	415-1123	#424-1306							
MAST06	062270	415-1128	#426-1369							
MAST07	062550	415-1133	#428-1417							
MAST10	062776	415-1138	#430-1458							
MAST11	063260	415-1143	#432-1506							
MAST12	063732	415-1148	#438-1615							
MAST13	064200	415-1153	#438-1662							
MAST14	064204	415-1158	#440-1666							
MAST15	064472	415-1163	#442-1717							
MASWR	002674	#41-1309	*90-2370	90-2372	91-2494	*409-956	409-958	413-1107		
MDISPL	002676	#41-1310	366-33	*366-33	366-34	*376-222	*390-460	390-461	*409-953	409-954
		*411-1034	*413-1066	413-1067	*415-1179	*421-1243	421-1244	*424-1308	424-1309	*426-1371
		426-1372	*428-1419	428-1420	*430-1461	430-1462	*432-1523	432-1524	*438-1617	438-1618
		*440-1674	440-1675	*442-1719	442-1720	458-2191	458-2191	490-3010	490-3010	490-3012
MEMDON	014410	100-2715	#103-2729							
MEMERR	177744	#12-337	282-6170	282-6177	*282-6177	282-6184	*282-6184	282-6190	*282-6190	284-6214
		*284-6214	284-6218	*284-6218	561-4704	561-4709	561-4714			
MHALT1	004532	#46-1438	46-1439							
MHALT2	005770	#59-1622	59-1623							
MHALT3	012760	#91-2503	91-2504							
MINDEX	002666	#41-1306								
MJPAT	021600	55-1560	152-3730	152-3730	152-3733	#152-3741				
MJSIZE	002466	#39-1252	*97-2627	*97-2631	*97-2637	*97-2638	*97-2639	*97-2640	97-2650	97-2655
		99-2694	561-4705							
MJTEST	021512	130-3208	#152-3724							
MKCONT	016664	130-3205	#132-3214	384-362						
MKCSRS	002334	#39-1201	*65-1707	*65-1710	*65-1715	65-1746	93-2548	132-3232	163-3956	297-6407
		299-6442	303-6505	364-7776	399-679	401-733	476-2594	480-2685		
MKCSRT	020124	55-1550	#143-3454							
MKFLAG	002126	#39-1160	72-2036	76-2113	82-2211	95-2569	95-2590	130-3200	172-4189	*325-6877
		*325-6897	328-6924	330-6964	330-6967	332-6996	332-7007	467-2412	471-2473	476-2582
MKPAT	021402	55-1555	150-3664	150-3664	150-3667	#150-3684				
MKSIZE	002470	#39-1253	*97-2628	*97-2633	*97-2641	*97-2642	*97-2643	*97-2644	97-2650	97-2657
		99-2694	561-4705							
MKTEST	021222	110-2849	130-3206	#150-3653						
MK11AD	172100	#14-553	61-1638	289-6276	291-6305	291-6324				

SYMBOL VALUE REFERENCES

```
MMR0    - 177572    #12-352    *286-6254  *286-6258  *316-6711  *316-6713  *318-6743  *318-6745  *376-221   399-691
                    *401-731    404-814   *406-831    561-4704   561-4714
MMR1    - 177574    #12-353     399-691   *401-731    404-813   *406-830    561-4704   561-4714
MMR2    - 177576    #12-354     399-691   *401-731    404 812   *406-829    561-4704   561-4714
MMR3    - 172516    #12-355    *63-1671   *63-1679   *108-2826  *316-6702  *316-6710  *318-6747  *318-6750  *334-7038
                    *336-7081   399-691   *401-731    404-811   *406-828    561-4704   561-4714
MMTRAP    036740     48-1471   #284-6227
MMVEC   - 000250    #12-333    *48-1471   *48-1472
MP1       012070     84-2284    84-2294   #88-2319
MP2       012224    #90-2392    90-2400    91-2437
MP3       012716     91-2466    91-2487   #91-2494
MP4       012552     90-2373   #91-2467
MP5       012764    #91-2506
MRUNSE    053640    #388-434    438-1624
MSEEDH    002720    #43-1323   *48-1447    48-1449
MSEEDL    002722    #43-1324   *48-1448    48-1450
MSGA34    113625    *132-3267  #569-4898
MSGA87    115753    *93-2536   *93-2540   #569-4957
MSGA98    116242    *484-2763  #569-4970
MSGB34    113642    *132-3268  #569-4900
MSG000    111176     57-1582   #569-4839
MSG001    111254     274-5962  #569-4840
MSG002    111336     274-5963  #569-4841
MSG003    111413     274-5964  #569-4842
MSG004    111520     274-5970   274-5988  #569-4844
MSG005    111626     277-6015  #569-4846
MSG006    111640     498-3467  #569-4847
MSG007    111675     279-6049  #569-4848
MSG008    111707     277-6029  #569-4849
MSG009    111721     279-6089  #569-4850
MSG010    111733     279-6135  #569-4851
MSG011    111745     274-5974   274-5987  #569-4852
MSG012    112033     274-5977   274-5989  #569-4853
MSG013    112130     277-6018  #569-4854
MSG014    112132     274-5986   277-6020   279-6145   460-2222   467-2388   469-2456  #569-4855
MSG015    112134    *134-3297   134-3298  *277-6038   277-6039  *279-6056  *279-6077   279-6078  *279-6094  *279-6097
                    *279-6099   279-6102  *279-6116  *279-6120  *279-6125   279-6126  *279-6138  *279-6142   279-6143
                    *473-2510  *473-2512   473-2514  *473-2530  *473-2532   473-2534  #569-4856
MSG016    112136     279-6112  #569-4857
MSG017    112150     274-5973   274-5976  #569-4858
MSG018    112161     465-2352   469-2454   473-2505   473-2523   480-2692   480-2694   482-2712   482-2726   482-2742
                    #569-4859
MSG019    112164    #569-4860
MSG020    112170     339-7126  #569-4861
MSG021    112224     339-7141  #569-4862
MSG022    113252     364-7782  #569-4885
MSG023    113274     343-7211  #569-4886
MSG024    113316     343-7214  #569-4887
MSG025    113340     341-7196   343-7225  #569-4888
MSG026    113371     339-7136  #569-4889
MSG027    113403     343-7207  #569-4890
MSG028    113420     343-7221  #569-4891
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SYMBOL	VALUE	REFERENCES						
MSG029	113434	345-7234	#569-4892					
MSG030	113454	349-7327	362-7749	#569-4893				
MSG031	113473	345-7235	347-7274	356-7559	#569-4894			
MSG032	113533	345-7257	347-7297	#569-4895				
MSG033	113552	345-7261	347-7301	#569-4896				
MSG034	113571	132-3269	#569-4897					
MSG035	113707	108-2803	#569-4902					
MSG036	113712	347-7273	#569-4903					
MSG037	113731	347-7304	#569-4904					
MSG038	113750	347-7313	#569-4905					
MSG039	113766	347-7306	#569-4906					
MSG040	114010	349-7326	#569-4907					
MSG041	114055	349-7335	#569-4908					
MSG042	114102	349-7339	#569-4909					
MSG043	114123	349-7344	#569-4910					
MSG044	114150	349-7349	354-7500	356-7573	358-7649	#569-4911		
MSG045	114175	349-7356	354-7507	356-7580	358-7656	#569-4912		
MSG046	114231	349-7368	352-7462	354-7518	356-7591	358-7667	#569-4913	
MSG047	114264	352-7489	#569-4914					
MSG048	114303	339-7129	#569-4915					
MSG049	114343	349-7364	#569-4916					
MSG050	114375	352-7455	#569-4917					
MSG051	114503	402-778	#569-4919					
MSG052	114523	352-7459	#569-4920					
MSG053	114554	352-7461	#569-4921					
MSG054	114572	352-7476	#569-4922					
MSG055	114642	354-7499	#569-4923					
MSG056	114663	354-7516	358-7665	#569-4924				
MSG057	114716	476-2585	*476-2621	476-2623	*476-2624	#569-4925		
MSG058	114722	480-2683	#569-4926					
MSG059	114766	356-7553	#569-4927					
MSG060	115016	356-7589	#569-4928					
MSG061	115060	469-2428	#569-4929					
MSG062	115067	492-3191	492-3250	#569-4930				
MSG063	115107	492-3192	#569-4931					
MSG064	115120	492-3193	492-3252	#569-4932				
MSG065	115130	492-3251	#569-4933					
MSG066	115142	461-2268	#569-4934					
MSG067	115225	463-2310	#569-4935					
MSG068	115234	467-2414	#569-4936					
MSG069	115241	467-2416	#569-4937					
MSG070	115246	97-2654	#569-4938					
MSG071	115271	97-2656	#569-4939					
MSG072	115304	97-2658	#569-4940					
MSG073	115317	358-7648	#569-4941					
MSG074	115336	*471-2472	*471-2493	471-2497	*475-2544	*475-2558	475-2560	#569-4943
MSG075	115341	314-6667	314-6688	#569-4944				
MSG076	115373	356-7630	#569-4945					
MSG077	115414	108-2801	#569-4946					
MSG078	115430	134-3296	#569-4947					
MSG079	115474	356-7621	#569-4948					
MSG080	115520	57-1592	#569-4949					

SYMBOL	VALUE	REFERENCES							
MSG081	115560	91-2474	#569-4950						
MSG082	115577	91-2476	#569-4951						
MSG084	115617	93-2522	#569-4952						
MSG085	115661	360-7702	#569-4953						
MSG086	115706	93-2534	#569-4954						
MSG087	115745	93-2541	#569-4956						
MSG088	115760	482-2706	#569-4959						
MSG089	115776	482-2721	#569-4960						
MSG090	116020	482-2737	#569-4961						
MSG091	116034	482-2730	482-2746	#569-4962					
MSG092	116046	490-3018	#569-4963						
MSG093	116062	490-3020	#569-4964						
MSG094	116070	490-3022	#569-4965						
MSG095	116077	490-3027	#569-4966						
MSG096	116106	#569-4967							
MSG097	116137	145-3570	#569-4968						
MSG098	116234	484-2764	#569-4969						
MSG099	116245	484-2774	#569-4972						
MSG100	116256	490-3014	#569-4973						
MSG101	116305	360-7711	#569-4974						
MSG102	116335	360-7716	#569-4975						
MSG103	116364	341-7170	#569-4976						
MSG104	116421	465-2362	#569-4977						
MSG105	116423	362-7745	#569-4978						
MSG106	116527	360-7722	#569-4979						
MSG107	116545	360-7728	#569-4980						
MSG108	116622	360-7734	#569-4981						
MSG109	116664	362-7740	#569-4982						
MSG110	116737	362-7759	#569-4983						
MSG111	117003	362-7764	#569-4984						
MSG112	117035	457-2142	#569-4985						
MSG113	117103	475-2568	#569-4986						
MSG114	117113	475-2571	#569-4987						
MSG115	117123	475-2574	#569-4988						
MSG116	117133	475-2577	#569-4989						
MST11A	063602	434-1567	#436-1575						
MTA030	024760	#172-4181	172-4208						
MTEST	016564	112-2871	114-2905	116-2941	118-2982	121-3024	123-3068	125-3115	127-3159 **#130-3193**
MTPA03	026506	155-3822	#192-4451						
MTPA04	026650	155-3843	#196-4513						
MTPA20	032572	163-3955	#237-5279						
MTPA21	033234	165-4031	#244-5416						
MTPA24	034060	166-4077	#254-5582						
MTPA25	034464	259-5653	259-5688	261-5696	#261-5707				
MTPA26	034576	168-4110	#264-5738						
MTPA32	034772	#268-5816	378-292						
MTPB03	026550	155-3826	#192-4476						
MTPB04	026704	155-3844	155-3855	#196-4526					
MTPB21	033264	165-4034	#244-5433						
MTPB24	034120	166-4078	#256-5626						
MTPB25	034504	259-5690	261-5698	#261-5714					
MTPB26	034612	168-4115	#264-5745						

SYMBOL	VALUE	REFERENCES							
MTPB32	035020	#268-5826	378-295						
MTPC03	026610	155-3827	#194-4494						
MTPC21	033320	165-4038	#244-5450						
MTPC24	034134	166-4079	#256-5634						
MTPC25	034536	259-5692	261-5701	261-5703	#261-5725				
MTPC26	034646	168-4111	#264-5763						
MTPD03	026630	155-3828	#194-4503						
MTPD21	033354	165-4041	#246-5468						
MTPD25	034412	259-5665	259-5667	259-5670	259-5672	#259-5688			
MTPD26	034666	168-4112	#264-5776						
MTPE25	034434	259-5676	259-5678	259-5681	259-5683	#261-5696			
MTP000	026376	68-1846	153-3786	170-4129	178-4306	#189-4413	189-4415	271-5945	370-133
MTP001	026422	153-3795	#189-4424	376-237					
MTP002	026454	153-3806	#189-4436	376-243					
MTP005	026724	155-3854	#196-4535						
MTP006	026760	157-3864	#199-4550						
MTP007	027150	157-3874	#202-4594						
MTP010	027250	157-3881	#204-4634						
MTP011	027356	159-3892	#207-4671						
MTP012	027766	159-3901	#210-4782						
MTP013	030344	159-3909	#213-4860						
MTP014	030716	159-3919	#218-4929						
MTP015	031312	161-3930	#221-5010						
MTP016	031700	161-3939	#224-5087						
MTP017	032302	161-3944	#229-5167						
MTP020	032360	#232-5201							
MTP022	033404	165-4050	165-4058	#249-5487					
MTP025	034152	166-4095	#259-5645						
MTP030	034704	172-4184	241-5406	#266-5784					
MTP031	034714	174-4226	#266-5790	266-5812					
MTP033	035054	176-4258	#268-5839						
MTP034	035106	178-4285	#270-5859	270-5902					
MTP20A	032360	163-3982	#232-5206	232-5210					
MTP20B	032376	163-3987	#232-5214	232-5223					
MTP20C	032430	163-3993	#232-5227	232-5236					
MTP20D	032462	163-4000	#232-5240	232-5249					
MTP20E	032514	163-4006	#234-5254	234-5263					
MTP20F	032546	163-4012	#234-5267	234-5274					
MTV020	023320	*163-3957	163-3958	*163-3971	163-3971	#163-3973			
MT0000	021704	#153-3781	349-7396						
MT0001	021740	150-3688	152-3745	#153-3789	349-7397				
MT0002	022000	150-3689	152-3746	#153-3798	349-7398				
MT0003	022050	152-3747	#155-3811	349-7399					
MT0004	022216	150-3690	152-3748	#155-3836	349-7400				
MT0005	022300	150-3691	152-3749	#155-3847	349-7401				
MT0006	022360	143-3454	#157-3860	349-7402					
MT0007	022414	150-3687	152-3744	#157-3867	349-7403				
MT0010	022456	143-3455	#157-3877	349-7404					
MT0011	022512	143-3457	#159-3886	349-7405					
MT0012	022570	143-3458	#159-3895	349-7406					
MT0013	022646	143-3459	#159-3904	349-7407					
MT0014	022722	143-3460	#159-3913	349-7408					

SYMBOL	VALUE	REFERENCES								
MT0015	023000	143-3461	#161-3924	349-7409						
MT0016	023056	143-3462	#161-3933	349-7410						
MT0017	023134	150-3686	152-3743	#161-3942	349-7411					
MT0020	023156	150-3693	#163-3949	349-7412						
MT0021	023612	150-3692	152-3750	#165-4021	349-7413					
MT0022	023734	150-3694	#165-4046	349-7414	358-7684					
MT0023	023766	152-3751	#165-4054	349-7415						
MT0024	024032	150-3696	152-3753	#166-4064	349-7416					
MT0025	024172	143-3456	#166-4090	349-7417						
MT0026	024240	150-3695	152-3752	#168-4100	349-7418					
MT0027	024370	103-2735	#170-4123	349-7419	352-7457					
MT0030	024754	105-2785	#172-4179	334-7036	336-7075	349-7420				
MT0031	025214	150-3697	152-3754	#174-4218	349-7421	354-7535				
MT0033	025340	150-3698	152-3755	#176-4238	349-7423					
MT0034	025530	150-3699	152-3756	#178-4276	349-7424					
MT0035	025652	150-3664	150-3685	150-3700	152-3730	152-3742	152-3757	#178-4297		
MT020X	023604	163-3991	163-3997	163-4004	163-4010	#163-4017				
MT020Y	023472	163-3985	#163-3999							
MT020Z	023322	163-3968	#163-3975							
MT0999	025772	55-1571	143-3463	143-3464	143-3465	143-3466	143-3467	143-3468	143-3469	143-3470
		143-3471	143-3472	143-3473	143-3474	143-3475	143-3476	143-3477	143-3478	143-3479
		143-3480	143-3481	143-3482	143-3483	143-3484	143-3485	150-3664	150-3702	150-3703
		150-3704	150-3705	150-3706	150-3707	150-3708	150-3709	150-3710	150-3711	150-3712
		150-3713	150-3714	150-3715	150-3716	150-3717	150-3718	150-3719	150-3720	150-3721
		152-3730	152-3759	152-3760	152-3761	152-3762	152-3763	152-3764	152-3765	152-3766
		152-3767	152-3768	152-3769	152-3770	152-3771	152-3772	152-3773	152-3774	152-3775
		152-3776	#180-4320	349-7422	349-7425	349-7426	349-7427			
MULHLT	056150	#404-791	404-792							
MULTIE	060746	409-979	409-1005	409-1022	411-1054	413-1088	413-1102	415-1121	415-1126	415-1131
		415-1136	415-1141	415-1146	415-1151	415-1156	415-1161	#415-1167		
MULTIO	002004	#39-1117	150-3654	152-3725	*360-7735	*362-7741				
MULTIP	003C14	#43-1358	46-1407	*57-1610	84-2256	*91-2463	*91-2486	*93-2524	93-2533	105-2783
		401-711	408-911	408-920	*409-977	*409-1003	*409-1020	*411-1053	*413-1087	*413-1101
		*415-1120	*415-1125	*415-1130	*415-1135	*415-1140	*415-1145	*415-1150	*415-1155	*415-1160
		*415-1165	*417-1198							
MULTIU	056142	401-711	#404-788							
MUT	002116	#39-1156	*103-2734	*103-2737	*110-2848	*110-2850	*130-3198	*130-3209	*349-7380	*354-7529
		*358-7678	465-2355	478-2651	*478-2653	478-2667	*478-2669	*478-2672		
M13BAL	054472	390-516	#392-541							
NEMCNT	002072	#39-1146	*66-1805	66-1818	*68-1857	68-1877	68-1889	68-1907	68-1931	*284-6210
		284-6211	*284-6216	561-4703						
NEWBAN	002400	#39-1221	172-4206	*316-6697	316-6703	*318-6738	322-6825	322-6838		
NEWKER	042322	316-6712	318-6744	#322-6835						
NEWLOA	042370	82-2227	311-6642	314-6659	318-6724	#322-6848				
NOCLOC	002104	#39-1151	*51-1512	430-1460	432-1518					
NOECCF	002474	#39-1255	*134-3299	*134-3301	159-3887	159-3896	159-3914	161-3925	161-3934	
NOERRO	002530	#39-1269	*341-7192	*343-7208	*343-7222	460-2213	460-2233	461-2251	*461-2277	463-2304
		463-2316	465-2359	*478-2664	*478-2670					
NOFSMO	002526	#39-1268	*170-4132	*170-4153	*170-4175	*172-4186	*172-4203	*172-4214	339-7128	
NOIIST	002756	*37-1106	#43-1338	57-1590	84-2271	84-2283	90-2373	366-15	408-912	409-959
NONEM	002102	#39-1150	*66-1806	*68-1844	*68-1916	*68-1925	284-6208			
NONEXI	036646	66-1807	68-1845	282-6172	#284-6208					

SYMBOL	VALUE	REFERENCES								
NOPAR	002100	#39-1149	*46-1424	*46-1434	*66-1804	*68-1843	*68-1875	*76-2087	*76-2099	*82-2223
		*82-2228	*103-2750	*103-2762	*132-3251	*150-3660	*150-3677	*152-3726	*152-3734	*159-3910
		*163-3954	*172-4183	*174-4223	*176-4243	*178-4281	*259-5650	*259-5685	282-6168	282-6179
		282-6187	282-6192	345-7232	*345-7233	*345-7265	347-7271	*347-7272	*347-7317	*349-7388
		*349-7393	354-7497	*354-7544	356-7551	*356-7584	*356-7613	358-7646	*358-7693	
NOSCOP	002540	#39-1273	*165-4022	*165-4043	*166-4067	*166-4088	*172-4186	*172-4203	*172-4214	*174-4221
		*174-4234	*176-4241	*176-4270	*178-4279	*178-4294	*368-77	*409-952	*415-1183	457-2145
		461-2256								
NOTAB	002464	#39-1251	279-6079	*467-2384	*467-2386					
NULLFL	002436	#39-1237	*180-4322	332-7007	*332-7020					
OLDCAC	002370	#39-1217	*289-6289	289-6297	*291-6313	291-6317	*291-6331	291-6334		
OLDMAR	002376	#39-1220	*330-6955	*330-6959	*330-6979	*332-6995	332-7008	332-7009	332-7009	*349-7324
ONCE	002732	#43-1328	57-1581	57-1591	*57-1613					
ONES	002726	#43-1326	46-1407	68-1895	70-1981	70-1982	95-2579	95-2580	95-2581	95-2582
		136-3354	136-3356	155-3839	249-5496	249-5498	271-5924	271-5929	332-7014	366-14
		366-27	417-1191	417-1192	417-1210	448-1945	478-2631	478-2633	478-2635	478-2638
		478-2640	478-2642							
O.ADR1	075706	#507-3633	523-3944	523-3949	523-3953	*523-3961	*523-3968	531-4089	*533-4105	533-4121
		537-4158	537-4159	537-4193						
O.BACK	077302	517-3831	#523-3929							
O.BD	101366	531-4096	531-4097	#547-4399						
O.BIAS	075604	#505-3613	515-3816							
O.BKP	= 000016	#502-3573	507-3634	507-3636	507-3638	523-3949	523-3953	523-3959	523-3966	527-4011
		529-4051	531-4065	531-4088	533-4104	537-4157	537-4196			
O.BKPT	077324	517-3833	#523-3937							
O.BK1	100060	509-3656	#531-4066							
O.BRK	100042	509-3678	#531-4063							
O.BW	075566	#505-3588	513-3752	*515-3783	*519-3858	*519-3861	519-3872	519-3881	521-3902	521-3909
		521-3912	*521-3913	*521-3916	523-3929	523-3932	525-3979	*525-3997	*525-3999	*533-4119
		539-4206	545-4323							
O.BYT	076772	517-3824	#519-3861							
O.CAD	075560	#505-3585	*513-3738	513-3754	*519-3871	519-3874	519-3877	519-3879	519-3885	*521-3907
		*521-3909	521-3910	521-3914	*523-3932	525-3985	545-4326	545-4328		
O.CADV	100634	519-3880	525-3989	525-3998	#539-4204	547-4348				
O.CLGT	= 000024	515-3808	#547-4379							
O.CLSE	101214	513-3751	521-3894	521-3904	523-3931	#545-4321				
O.CMFD	075600	#505-3604	*515-3786	515-3814	*519-3850	519-3864				
O.CR	101316	545-4330	545-4332	545-4333	#547-4355					
O.CRET	077140	517-3825	#521-3894							
O.CRLF	101246	521-3911	531-4095	537-4176	#545-4330					
O.CRLS	101254	515-3784	#545-4332							
O.CSR1	075574	#505-3601	*537-4167	537-4183						
O.CSR2	075575	#505-3602	*537-4168	537-4184						
O.CT	075730	#507-3635	*523-3962	*523-3970	*529-4047	*533-4107	*533-4109			
O.CTLC	076162	#509-3685	517-3839							
O.CTLE	076242	#511-3705	517-3841							
O.CTLF	076210	#511-3695	517-3840							
O.C1	100000	#529-4051	533-4108							
O.DCD	076520	513-3766	513-3768	#515-3783	521-3895	533-4123				
O.DCDA	077144	#521-3895	523-3956	523-3963	523-3967					
O.DCD1	076550	515-3775	#515-3790	519-3851						
O.DCD3	076530	#515-3785	519-3882	519-3889	525-4000					

SYMBOL		VALUE	REFERENCES								
O.DOT		075562	#505-3586	*519-3870	521-3907	*521-3910					
O.ERR		076510	513-3757	#515-3781	515-3809	519-3866	521-3897	525-4002			
O.ERR1		077572	523-3942	523-3950	523-3954	523-3960	525-3980	525-3984	#525-4002	527-4008	527-4010
			527-4013	529-4039	529-4042	529-4044					
O.ERR2		077164	#521-3903	523-3930							
O.ERR3		077150	#521-3897	521-3903							
O.FIL		075576	#505-3603	*543-4292	*543-4295						
O.FTYP		100730	515-3782	519-3884	519-3886	519-3888	521-3921	525-3982	533-4112	533-4116	533-4118
			539-4219	539-4224	#539-4229	539-4230	541-4269	543-4289	543-4294		
O.GET		101006	511-3716	515-3792	#541-4250	541-4251	541-4270	541-4274			
O.GO		077576	517-3827	#527-4007							
O.GOGO		077624	511-3709	#527-4015							
O.GO2		077676	527-4022	#527-4025	529-4059						
O.ID		101300	509-3663	#547-4350							
O.IDND	=	101315	509-3664	#547-4354							
O.LG	=	000020	511-3720	#547-4397							
O.LGCH		101321	515-3805	#547-4359	547-4379						
O.MIN		076502	#515-3774	517-3838							
O.MINS		075603	#505-3611	*515-3774	*515-3787	515-3811	*515-3817				
O.ODT		075774	488-2948	#509-3647	511-3700						
O.OFST		077466	517-3832	#525-3979							
O.OLD		077154	517-3830	#521-3901							
O.OP1		077160	517-3828	#521-3902							
O.OP2		077220	#521-3910	523-3933							
O.OP2A		077226	513-3739	#521-3911							
O.ORAB		076364	#513-3740	517-3835							
O.ORPC		076342	#513-3734	517-3829							
O.ORRB		076374	#513-3743	517-3836							
O.P		075573	#505-3598	*509-3654	*509-3676	*527-4011	529-4040	529-4051	*531-4065	*533-4106	533-4113
			533-4120								
O.PRI		075704	#507-3629	509-3669	531-4070	531-4074					
O.PROC		077732	517-3834	#529-4038							
O.PR1		077764	529-4046	#529-4048							
O.RALL		077430	509-3679	523-3958	#523-3964						
O.RCSR	=	177560	#502-3579	537-4167	*537-4169	537-4179	537-4181	*537-4183	541-4250		
O.RDB	=	177562	#502-3578	541-4252							
O.REGT		076270	#511-3716	517-3826							
O.REM		100602	509-3668	531-4069	#537-4190						
O.RORA		101272	521-3915	533-4122	#547-4348						
O.RRST		101172	509-3649	#545-4302							
O.RSB		100450	527-4024	#537-4157							
O.RSR		100416	527-4025	#535-4143							
O.RSTT		100534	527-4018	529-4050	#537-4176						
O.S		075571	#505-3592	*509-3655	*509-3675	*513-3765	*513-3767	527-4021	529-4053	531-4084	537-4190
O.SCAN		076554	511-3727	#515-3792	515-3803						
O.SCRN		075602	#505-3609	541-4260	541-4271						
O.SEMI		076742	517-3822	#519-3847							
O.SEQ		075570	#505-3591	*521-3901	521-3905	*521-3908					
O.SMFD		075601	#505-3606	513-3761	*515-3785	*519-3849	519-3867	527-4007	529-4038		
O.SNGL		076446	#513-3761	517-3837							
O.STM	-	000340	#502-3575	509-3677	527-4016	529-4048	529-4055				
O.SVR		100360	509-3661	509-3667	531-4067	#535-4129					

SYMBOL	VALUE	REFERENCES								
O.SVTT	100500	509-3659	531-4094	533-4110	#537-4167					
O.T	075572	#505-3597	*527-4019	*529-4057	531-4067					
O.TBIT	077644	#527-4019	529-4052	529-4054	531-4068					
O.TBT	- 000020	#502-3576	527-4020	527-4023	527-4030	529-4058	531-4080			
O.TCL2	076442	#513-3757	513-3762							
O.TCSR	= 177564	#502-3581	537-4168	*537-4170	537-4171	537-4177	*537-4184	539-4229		
O.TDB	- 177566	#502-3580	*539-4243							
O.TL	101345	511-3717	511-3720	511-3728	#547-4381	547-4397				
O.TRTC	101370	523-3937	523-3965	537-4159	#547-4400					
O.TVEC	= 000014	#502-3574	509-3650	*509-3677	*509-3678					
O.TYPE	101126	509-3665	509-3688	511-3698	511-3707	531-4098	#543-4286	543-4291	543-4297	545-4334
O.TYP1	101004	#539-4244	543-4287							
O.UIN	075752	#507-3637	*523-3969	*537-4158	537-4193					
O.UPC	075700	#507-3627	*509-3653	*527-4015	527-4027	*531-4063	531-4083	*531-4087	*531-4100	
O.URO	075662	#507-3620	509-3662	511-3725						
O.USP	075676	#507-3626	509-3685	511-3695	*535-4130	535-4131	535-4150			
O.UST	075702	#507-3628	*527-4020	*527-4023	527-4026	527-4029	*529-4058	*531-4064	531-4072	*545-4302
O.WRD	076760	517-3923	#519-3858							
O.WRD1	077036	519-3939	#519-3872	521-3922						
O.WST	101202	509-3651	509-3674	527-4017	527-4031	529-4049	529-4056	531-4082	#545-4312	
O.XXX	075564	#505-3587	*535-4129	535-4137	*535-4144	535-4151				
PADDRE	002042	#39-1135	*282-6176	561-4702						
PAFBAF	015730	100-2720	#121-3010	121-3039	121-3047					
PAFBAW	016066	100-2721	#123-3052	123-3083	123-3088	123-3096				
PARBAF	016246	100-2722	#125-3101	125-3130	125-3138					
PARBAW	016404	100-2723	#127-3143	127-3174	127-3179	127-3187				
PARCNT	002074	#39-1147	*66-1803	66-1815	*68-1856	68-1887	68-1905	68-1927	*82-2229	*103-2755
		103-2757	*282-6173	282-6174	561-4702					
PARITY	036454	48-1465	#282-6168							
PARTHF	002372	#39-1218	*259-5652	*261-5714	*261-5725	*261-5728	282-6189	345-7232	*345-7248	*345-7265
		347-7271	*347-7287	*347-7317	*356-7585					
PARVEC	000114	#12-331	*48-1465	*48-1466						
PASFLG	002362	#39-1213	*130-3199	*132-3253	*172-4180	172-4197	*172-4198	207-4698	207-4769	*207-4771
		213-4872	215-4916	*215-4918	218-4944	218-4997	*218-4999	221-5021	221-5074	*221-5076
		224-5100	226-5154	*226-5156	*349-7381					
PATERR	002076	#39-1148	68-1848	*68-1855	68-1885	68-1903				
PATPLU	005472	55-1551	55-1553	55-1556	55-1558	55-1561	55-1563	#55-1567		
PATTER	002120	#39-1157	*110-2844	*112-2867	*114-2910	*116-2937	*118-2987	*121-3011	*123-3053	*125-3123
		*127-3167	150-3662	152-3728	*328-6932	328-6933	*328-6938	349-7323	*349-7341	349-7342
		349-7343	349-7390	*349-7435	352-7448	*352-7491	354-7497	*354-7544	358-7646	*358-7693
PCBUMP	002406	#39-1224	*150-3661	*152-3727	*155-3813	*155-3838	*155-3849	*157-3862	*157-3879	*168-4102
		282-6183	349-7323	*349-7389	*349-7433					
PCONFI	035402	97-2660	#274-5953	349-7441						
PCONFS	035662	*274-5955	274-5992	#274-5998						
PCONF1	035572	274-5966	#274-5983							
PCONF2	035630	274-5956	274-5981	#274-5992						
PDP110	036752	48-1467	#284-6230							
PENDBO	002330	#39-1197	*65-1708	*65-1735	78-2136	78-2137				
PERA05	064732	#446-1908	446-1915							
PERBNK	065564	394-599	449-1989	449-2001	451-2016	#453-2037	455-2111			
PERECC	065650	#453-2053	453-2065							
PERRAB	065402	446-1930	446-1935	#449-2000						

SYMBOL		VALUE	REFERENCES								
PERRAW		065330	394-580	396-612	446-1887	446-1893	446-1899	446-1905	446-1920	446-1925	448-1941
			448-1946	448-1951	448-1956	448-1961	448-1966	448-1976	448-1981	448-1986	#449-1988
PERRA3		054652	#394-582	451-2022	451-2026						
PERRA7		065454	448-1971	#451-2013							
PERR01	=	104427	#10-198	189-4432	268-5854						
PERR02	=	104430	#10-199	189-4420	189-4445	268-5848					
PERR03	=	104431	#10-200	194-4498	194-4506						
PERR04	=	104432	#10-201	196-4522	196-4544						
PERR05		064726	#446-1907								
PERR06		064754	#446-1914								
PERR07	=	104433	#10-202	199-4560	199-4579						
PERR10	=	104434	#10-203	199-4565	199-4584						
PERR11	=	104435	#10-204	202-4602	204-4652	237-5309	239-5353	241-5396			
PERR12	=	104436	#10-205	202-4608	204-4659						
PERR13	=	104437	#10-206	202-4616							
PERR14	=	104440	#10-207	202-4622							
PERR15	=	104441	#10-208								
PERR16	=	104442	#10-209								
PERR17	=	104443	#10-210	244-5421	244-5443	244-5454	246-5478	251-5535	251-5539		
PERR20	=	104444	#10-211	244-5427	244-5437	244-5460	246-5472	251-5544	251-5548		
PERR21	=	104445	#10-212	239-5332	241-5378						
PERR22	=	104446	#10-213	229-5189	268-5834						
PERR23	=	104447	#10-214	254-5611	256-5640						
PERR24		104450	#10-215	254-5616							
PERR25	=	104451	#10-216	264-5751	264-5756						
PERR26	=	104452	#10-217	232-5219	232-5244	234-5271					
PERR27	=	104453	#10-218	232-5231	234-5259						
PERR30	=	104454	#10-219	266-5797							
PERR31	=	104455	#10-220	207-4725	207-4731	218-4975	218-4981	221-5055	221-5060	224-5131	224-5137
PERR32	=	104456	#10-221	207-4737	207-4751						
PERR33	=	104457	#10-222	210-4821							
PERR34	=	104460	#10-223	207-4743	207-4757	210-4829					
PERR35	=	104461	#10-224	270-5871	270-5878						
PERR36		104462	#10-225								
PERR37	=	104463	#10-226								
PERR40	=	104464	#10-227								
PERR41		104465	#10-228								
PERR42	=	104466	#10-229								
PERR43		104467	#10-230								
PERXOR		065540	449-1992	449-2004	451-2015	#451-2028	453-2060	455-2096			
PFLAG		002130	#39-1161	110-2847	314-6654	*325-6879	*325-6900	390-466	413-1076	421-1252	424-1317
			426-1377	428-1425	430-1467	434-1534	438-1623	440-1684			
PHYADD		002044	#39-1136	*469-2434	*469-2435	*469-2436	*469-2437	*469-2439	469-2440		
PORTCO		002646	#41-1304	*374-172	374-191	*374-191	*374-198	*390-469	*390-469	*390-469	*390-469
			*390-504	392-546	392-547	430-1491	430-1492	436-1583	436-1584	561-4718	561-4718
			561-4718	561-4718	561-4725	561-4725	561-4725	561-4725			
PORTDI		002606	#41-1300	*57-1600	*57-1607	*84-2279	93-2520	93-2520	93-2535	93-2542	366-23
			408-920	561-4719	561-4719	561-4719	561-4719				
PSW	=	177776	#12-261	*61-1651	*61-1652	*61-1658	*68-1868	*68-1881	*68-1898	*68-1920	*70-1969
			*136-3332	*147-3630	*174-4225	*176-4251	*178-4284	*183-4357	*186-4391	*274-5959	*291-6345
			*291-6347	*316-6699	*318-6740	*320-6791	*320-6807	*336-7087	*345-7251	*347-7291	*347-7309
			*349-7372	*352-7466	*354-7522	*356-7595	*356-7602	*358-7671	*366-22	*366-30	*366-59

SYMBOL	VALUE	REFERENCES								
		*368-67	*368-81	*370-101	*372-146	*372-158	*374-165	*374-169	*374-190	*376-232
		*378-263	*378-280	*380-304	*380-312	*380-333	*384-371	*384-375	*386-387	*386-398
		*388-441	*388-452	*390-468	*390-496	*394-571	*394-593	*396-608	*396-622	*399-670
		*399-674	*402-756	*402-760	*404-799	*406-836	*408-925	*482-2717	*482-2718	*482-2734
PTYBUF	002636	#41-1303	84-2288	*372-149	372-153	372-159	*372-159	*408-928	*409-966	*438-1628
		438-1649	438-1650	484-2765	484-2766					
PTYFLA	002626	#41-1302	408-926	*408-929	457-2136	457-2136	457-2136	457-2136	484-2759	*484-2767
		484-2770	*484-2775							
PWLOCK	002760	#43-1339	*398-642	*404-789						
PWRVEC	= 000024	#12-324	*48-1463	*48-1464	*53-1529	*398-646	*398-647	*399-704	*401-712	*402-777
		404-800	404-801	*404-803	*404-804	*406-837	*406-838			
QUE	072154	90-2393	91-2443	91-2480	390-482	390-528	409-973	409-1016	411-1046	413-1082
		421-1265	421-1287	424-1329	424-1351	426-1401	428-1442	430-1478	436-1603	438-1636
		440-1701	442-1726	457-2137	#484-2754					
QUE1	072222	#484-2765	484-2772							
QUICK	002536	#39-1272	*53-1528	336-7074						
QVFLAG	002440	#39-1238	*53-1528	*53-1532	108-2802	*108-2804	163-3984	207-4764	210-4846	215-4911
		218-4992	221-5069	226-5149	330-6952	332-6992				
RANDOD	034626	*168-4114	#264-5753	*264-5757						
RDCHR	- 104411	#10-177	491-3085							
RDDEC	- 104414	#10-180	339-7137							
RDLIN	= 104412	#10-178	492-3162	492-3213						
RDOCT	= 104413	#10-179	57-1593	343-7212	343-7215	345-7236	347-7275	347-7307	349-7328	349-7340
		349-7345	349-7350	354-7501	356-7560	356-7574	358-7650	360-7703	362-7750	364-7783
READCS	104426	#10-196	65-1709	78-2152	134-3294	138-3395	140-3427	147-3636	237-5303	239-5325
		239-5347	241-5371	241-5390	259-5662	261-5719	261-5730	297-6413	297-6432	299-6448
		299-6467	341-7191	343-7206	343-7220	394-586	399-684	471-2477	480-2690	
READON	002504	#39-1259	*370-105	*370-116	370-139	*376-231	376-256	*376-258	*378-270	*378-276
REALPA	002366	#39-1216	*153-3782	*153-3790	*153-3799	*155-3812	*155-3837	*155-3848	*157-3861	*157-3868
		*157-3878	*159-3891	*159-3900	*159-3908	*159-3918	*161-3929	*161-3938	*161-3943	*163-3953
		*165-4023	*165-4049	*165-4057	*166-4068	*166-4094	*168-4101	*170-4126	*172-4181	*174-4222
		*176-4242	*178-4280	*178-4298	*180-4321	*372-150	453-2066	453-2069	453-2072	453-2075
		458-2178	467-2400	490-3028						
REFRES	033760	249-5522	#251-5559							
REFSUB	034030	251-5562	251-5566	#251-5570						
REGCOP	035204	153-3785	153-3794	#271-5907	370-136					
RELOCA	041130	112-2885	114-2919	116-2960	118-3001	121-3044	123-3093	125-3135	127-3184	172-4200
		#314-6649								
RELOC1	041456	#316-6697	368-70							
RESREG	= 104416	#10-183	155-3829	166-4084	168-4116	271-5948	320-6774	320-6811	339-7130	341-7184
		#370-140	378-296	419-1237	465-2358	496-3346				
RESTAR	002752	*37-1102	*37-1104	#43-1336	51-1483					
RESVEC	- 000010	#12-319	*48-1467	*48-1468						
RLFLAG	002134	#39-1163	112-2882	114-2916	116-2957	118-2998	121-3041	123-3090	125-3132	127-3181
		*316-6714	*318-6746	325-6901	334-7035	336-7073	339-7128	*368-76	398-659	458-2188
		484-2776	490-3017							
RRFLAG	002132	#39-1162	112-2865	114-2899	116-2935	118-2976	121-3020	123-3064	125-3111	127-3155
		132-3240	170-4136	170-4159	172-4190	*325-6879	*325-6885	*325-6900	*325-6903	*325-6911
		349-7363	352-7479	354-7533	358-7682					
SAVREG	- 104415	#10-182	155-3823	166-4076	168-4109	271-5942	320-6772	320-6775	339-7125	370-137
		378-293	419-1223	463-2289	496-3331					
SBECSR	002150	#39-1168	*150-3672	*150-3673	*237-5283	*237-5284	475-2545	475-2548		

SYMBOL		VALUE	REFERENCES								
SBEFLA		002022	#39-1127	105-2773	*108-2796	*150-3671	*237-5282				
SBFMSK		002350	#39-1210	*207-4693	*207-4694	207-4709	207-4711	207-4759	*207-4761	*207-4761	*210-4788
			*210-4789	210-4794	210-4796	210-4806	210-4841	*210-4843	*210-4843	*213-4866	*213-4867
			213-4877	213-4879	213-4883	213-4885	215-4912	*215-4914	*215-4914	*218-4938	*218-4939
			218-4949	218-4951	218-4955	218-4957	218-4993	*218-4995	*218-4995	*221-5015	*221-5016
			221-5026	221-5028	221-5032	221-5034	221-5070	*221-5072	*221-5072	*224-5094	*224-5095
			224-5104	224-5106	224-5110	224-5112	226-5150	*226-5152	*226-5152		
SBETES		017374	132-3247	#136-3306							
SCOPE	-	000004	#12-260	65-1689	66-1796	68-1833	70-1956	72-2031	100-2710	103-2730	103-2740
			183-4363	186-4397							
SDPAR0	-	172260	#12-429	155-3828	166-4078	166-4080	168-4112	194-4501	254-5623		
SDPAR7	=	172276	#12-436								
SDPDR7	=	172236	#12-416								
SECOND	-	011661	#14-559	90-2391	390-481	390-527	409-972	409-999	409-1015	413-1081	417-1193
			421-1264	421-1286	424-1328	424-1350	426-1400	428-1441	430-1477	436-1602	438-1635
			440-1700	442-1725							
SEFDHI		002714	#43-1321	*48-1449	168-4104	*168-4119	388-439	494-3304	494-3311	*494-3316	
SEFDLO		002716	#43-1322	*48-1450	168-4103	*168-4118	494-3303	494-3309	*494-3315		
SELONL		002002	#39-1116	103-2733	103-2748	132-3227	325-6910	*362-7760	*362-7765		
SETMAR		043212	114-2903	118-2980	125-3113	127-3157	#332-6989				
SETPAT		042762	114-2901	118-2978	#328-6936						
SHALT		004420	#46-1412								
SHUTUP		043554	108-2813	336-7054	#336-7062						
SIDE		002422	#39-1231	*132-3234	132-3268	*132-3271	132-3271	145-3506	145-3522	145-3538	145-3554
			145-3582	145-3598	145-3614	147-3647	147-3648	*163-3961			
SIDEOK		021066	132-3244	#147-3624							
SIPAR0	=	172240	#12-419	311-6606							
SIPAR3	-	172246	#12-422	311-6620							
SIPDR0	-	172200	#12-399	311-6608	398-663	401-748					
SIZE	=	040000	#14-558	66-1809	68-1864	68-1893	68-1918	153-3784	153-3792	153-3801	155-3818
			155-3842	155-3853	168-4108	170-4141	170-4164	172-4191	176-4247	176-4266	178-4300
			241-5408	268-5850	271-5944	316-6700	318-6741	320-6792	320-6808	352-7484	368-87
			370-107	376-249	378-269	378-290	426-1383				
SIZELO	-	177760	#12-343	80-2172	80-2174	80-2176	80-2180				
SKIPKA		002012	#39-1120	341-7172	*341-7174	*360-7712	*360-7718				
SLAVEM		061244	59-1626	417-1214	#419-1221						
SLAVEN		075774	#507-3639	569-5002	569-5003						
SLAVER		002570	#39-1285	460-2242	*484-2777	*484-2779					
SLAVES		002730	#43-1327	*57-1594	57-1596	57-1596	57-1599	76-2108	*76-2109	*78-2130	*90-2396
			*91-2449	*91-2455	91-2462	*91-2486	91-2492	93-2515	93-2543	99-2699	325-6892
			382-341	382-342	390-475	390-490	390-523	390-536	392-553	409-983	409-1026
			411-1059	413-1104	415-1117	421-1278	421-1296	421-1300	424-1342	424-1360	424-1364
			426-1393	426-1409	428-1434	428-1450	430-1472	430-1486	430-1498	432-1521	434-1549
			434-1556	434-1564	434-1568	436-1596	438-1630	438-1644	438-1655	440-1693	440-1709
			440-1712	442-1734							
SLAVE1	-	000040	#14-562	84-2257	95-2571	95-2580	279-6096	408-921			
SLAVE2	-	000100	#14-563	84-2261	95-2571	95-2581	279-6096	408-922			
SLAVE3	=	000200	#14-564	84-2265	95-2571	95-2582	279-6096	408-923			
SLAVUP		061216	86-2316	384-358	409-986	#417-1213					
SLFLAG		002656	#41-1305	*95-2578	*95-2578	*95-2578	*95-2578	*95-2579	*95-2580	*95-2581	*95-2582
			*382-340	*382-345	382-350	*382-350	390-503	561-4701	561-4701	561-4701	561-4701
SLPAT		051570	370-120	370-122	370-124	370-126	370-128	#370-130			

SYMBOL	VALUE	REFERENCES								
SLPAT0	051530	#368-89	#370-109	#370-119	378-271					
SLPAT1	051534	368-90	370-110	#370-121	378-272					
SLPAT2	051542	368-91	370-111	#370-123	378-273					
SLPAT3	051550	368-92	370-112	#370-125	378-274					
SLPAT4	051556	368-93	370-113	#370-127	378-275					
SLPAT5	051564	368-94	370-114	#370-129						
SOBK	002704	#43-1317	174-4228							
SOBLEN	= 000056	174-4226	174-4231	#266-5812						
SOFTPA	002744	#43-1333	*48-1453	*105-2780	178-4301					
SOURCE	002402	#39-1222	*207-4704	*210-4792	*213-4881	*218-4953	*221-5030	*224-5108	*259-5648	306-6539
SPECIA	002432	#39-1235	132-3244	*138-3394	*145-3500	*145-3516	*145-3532	*145-3548	*145-3576	*145-3592
		*145-3608	163-3963							
SSP	=%000006	#12-277	*61-1655	*183-4358	*186-4392	399-675	*402-757	482-2719		
ST	- 177776	#502-3572	545-4302	*545-4312						
STACK	002000	#12-255	12-256	37-1094	37-1108	43-1318	46-1428	53-1531	91-2507	108-2809
		368-71	409-978	409-1004	409-1021	409-1028	413-1105			
START	004352	37-1103	37-1105	#46-1403	78-2158	90-2387	336-7059	404-793		
START1	000300	37-1098	#37-1102	37-1107						
START2	000310	37-1099	#37-1104							
START3	000200	#37-1098	569-5012							
START4	000322	37-1100	#37-1106							
STOPCP	011720	#84-2282	376-224							
STOPOK	002520	#39-1265	*82-2239	457-2140	*457-2141					
STRIPE	002460	#39-1249	*249-5501	249-5505	251-5526	*251-5556	251-5556			
STRTDI	002364	#39-1215								
SUBAAA	005532	55-1565	#57-1578							
SUBAAB	005200	#53-1516								
SUBAAQ	007720	68-1876	#70-1937							
SUBAAR	013160	84-2256	#93-2546							
SUBAAS	007002	65-1776	#66-1795							
SUBAAT	011334	80-2173	80-2186	#82-2201						
SUBAAU	014602	103-2764	#105-2773							
SUCCES	002424	#39-1232	*132-3237	*132-3258	132-3266	*356-7623	356-7629	*356-7631	*476-2589	476-2613
		476-2620	*478-2629	*478-2631	*478-2633	*478-2635	*478-2638	*478-2640	*478-2642	
SUPDOA	002360	#39-1212	*155-3824	*157-3864	*157-3874	*157-3881	*159-3892	*159-3901	*159-3909	*159-3919
		*161-3930	*161-3939	*161-3944	*163-3955	*165-4050	*165-4058	*166-4080	*166-4095	*170-4131
		*174-4232	*176-4264	*178-4289	*178-4308	186-4394	*370-135	*372-151	*374-181	*376-252
SUPDO1	026042	103-2756	153-3787	153-3796	153-3807	163-3983	165-4032	168-4113	168-4117	170-4144
		170-4167	172-4193	178-4314	#183-4334	271-5947	370-138	376-255	378-294	
SUPDO2	026056	155-3830	155-3845	155-3856	163-3988	163-3994	163-4001	163-4007	163-4013	165-4035
		165-4039	165-4042	176-4269	#183-4336	378-297				
SUPDO3	026220	155-3825	157-3865	157-3875	157-3882	159-3893	159-3902	159-3911	159-3920	161-3931
		161-3940	161-3945	165-4051	165-4060	166-4096	170-4147	170-4170	178-4311	#186-4369
		352-7486	370-139	372-154	376-256					
SUPDO4	026234	163-4017	166-4081	166-4087	174-4233	176-4265	178-4293	#186-4370	374-182	374-186
SUPDR0	002266	#39-1179	*183-4338	183-4346	*186-4372	186-4380				
SUPDR1	002270	#39-1180	183-4339	186-4373						
SUPDR2	002272	#39-1181								
SUPDR3	002274	#39-1182								
SUPDR4	002276	#39-1183								
SUPDR5	002300	#39-1184								
SUPDR6	002302	#39-1185	183-4349	186-4383						

SYMBOL CROSS REFERENCE CREF V01

SYMBOL	VALUE	REFERENCES								
SUPLIM	057372	#408-947	569-4997	569-4998						
SUPM15	053752	#390-458	438-1663							
SUPSTK	- 000740	#12-257	61-1654	183-4358	186-4392	482-2722	482-2728			
SWAPAT	002764	#43-1343	*48-1452							
SWR	002766	#43-1346	*51-1496	51-1498	*51-1503	*53-1525	63-1666	66-1826	70-2022	90-2370
		*90-2371	90-2372	*91-2494	97-2659	100-2712	108-2802	150-3655	150-3668	163-3984
		163-3989	163-3995	163-4002	163-4008	207-4763	210-4845	215-4910	218-4991	221-5068
		226-5148	274-5966	314-6650	314-6666	314-6687	330-6952	332-6992	349-7355	349-7383
		352-7450	354-7506	354-7511	356-7554	356-7579	356-7603	358-7655	358-7660	399-700
		401-719	409-956	*409-957	409-958	*413-1107	457-2140	457-2148	457-2164	460-2219
		460-2242	460-2245	461-2252	461-2256	465-2359	488-2952	488-2960	488-2982	
SWREG	- 000176	#14-550	51-1503	63-1666	90-2371	409-957	488-2952			
SW0	= 000001	#12-297	66-1826	70-2022	150-3655	150-3668	163-3989	163-3995	163-4002	163-4008
		349-7383	352-7450	354-7511	356-7554	358-7660				
SW1	000002	#12-296								
SW10	002000	#12-287	460-2219							
SW11	- 004000	#12-286	108-2802	163-3984	207-4763	210-4845	215-4910	218-4991	221-5068	226-5148
		330-6952	332-6992	349-7355	354-7506	356-7579	358-7655			
SW12	- 010000	#12-285	314-6650							
SW13	- 020000	#12-284	314-6666	314-6687	460-2242					
SW14	- 040000	#12-283	457-2148							
SW15	100000	#12-282								
SW2	000004	#12-295								
SW3	000010	#12-294								
SW4	000020	#12-293	274-5966							
SW5	000040	#12-292	460-2245							
SW6	- 000100	#12-291	97-2659							
SW7	000200	#12-290	465-2359							
SW8	000400	#12-289	457-2140							
SW9	001000	#12-288	457-2164	461-2256						
SYSSIZ	011210	80-2178	80-2182	#80-2189						
SYSTID	177764	#12-347	57-1600	84-2272	366-16	408-913				
TAG2$	007366	68-1851	#68-1873							
TAG3$	007412	68-1872	#68-1877							
TAG4$	026136	183-4347	#183-4349							
TAG70$	067636	465-2332	#467-2369							
TAG71$	067646	465-2333	#467-2375							
TAG72$	067656	465-2334	#467-2381							
TAG73$	067722	465-2335	#467-2394							
TAG74$	067730	465-2336	#467-2400							
TAG75$	067742	465-2337	#467-2406							
TAG76$	067754	465-2338	#467-2412							
TAG77$	067776	465-2339	#469-2423							
TAG78$	070000	465-2340	#469-2428							
TAC79$	070006	465-2341	#469-2434							
TAG80$	070066	465-2342	#469-2448							
TAG81$	070100	465-2343	#469-2454							
TAG82$	070122	465-2344	#471-2472							
TAG83$	070324	465-2345	#473-2504							
TAG84$	070410	465-2346	#473-2522							
TAG85$	070502	465-2347	#475-2543							
TAG86$	070612	465-2348	#475-2567							

SYMBOL	VALUE	REFERENCES								
TAG9$	007232	#68-1849	68-1879	68-1912	68-1934					
TASK	002616	#41-1301	*84-2285	*84-2298	91-2453	91-2490	366-31	366-35	*366-60	368-82
		370-102	376-233	378-264	378-281	*380-306	*390-474	390-488	*390-522	390-534
		409-981	409-1024	*411-1043	411-1057	*413-1080	413-1090	*417-1217	*421-1258	421-1271
		*421-1277	421-1293	*424-1322	424-1335	*424-1341	424-1357	*426-1391	426-1407	*428-1433
		428-1448	*430-1471	430-1484	*434-1542	*434-1555	436-1609	*438-1629	438-1642	*440-1689
		*440-1691	440-1707	*442-1724	442-1732					
TASKDO	050726	84-2301	366-5	#366-10	390-476	417-1218	421-1261	421-1280	424-1325	424-1344
		426-1395	428-1436	430-1473	434-1544	434-1557	438-1631	440-1695		
TASKRE	050710	#366-4	366-62							
TASK00	051234	#366-39	#366-63							
TASK01	051236	366-40	#368-66							
TASK02	051330	366-41	#368-80							
TASK03	051430	366-42	#370-100							
TASK04	051664	366-43	#372-145							
TASK05	051774	366-44	#374-164							
TASK06	052300	366-45	#376-219							
TASK07	052326	366-46	#376-226							
TASK10	052336	366-47	#376-230							
TASK11	052536	366-48	#378-262							
TASK12	052644	366-49	#378-279							
TASK13	052726	366-50	#380-301							
TASK14	053276	366-51	#384-356							
TASK15	053310	366-52	#384-361							
TASK16	053316	366-53	#384-365							
TASK17	053334	366-54	#384-370							
TASK20	053422	366-55	#386-385							
TASK7A	052344	376-228	#376-232							
TBG4$	026314	186-4381	#186-4383							
TCFIG1	036012	#279-6051	279-6081	467-2385						
TCONFI	035664	274-5971	274-5980	274-5990	#277-6015					
TEMP	002534	#39-1271	*99-2666	99-2683	*99-2684					
TESTAD	002506	#39-1260	*132-3246	*132-3261	132-3261	136-3331	157-3863	157-3880	207-4713	207-4775
		210-4798	210-4836	210-4853	213-4863	215-4922	218-4963	218-4969	218-5003	221-5040
		221-5047	221-5051	221-5079	224-5118	224-5127	226-5159	259-5651	453-2055	
TIME	002434	#39-1236	*352-7458	352-7460						
TIMEOU	036726	48-1469	51-1502	51-1513	57-1612	61-1646	65-1774	66-1823	68-1874	76-2098
		#284-6223	341-7194	341-7198	343-7210	343-7227	345-7266	347-7318	458-2195	
TKVEC	- 000060	#12-327	274-5954	274-5954	*274-5956	*274-5957	*274-5995	*274-5995	349-7323	349-7323
		*349-7369	*349-7370	*349-7431	*349-7431	352-7448	352-7448	*352-7463	*352-7464	*352-7474
		*352-7474	354-7497	354-7497	*354-7519	*354-7520	*354-7544	*354-7544	356-7551	356-7551
		*356-7592	*356-7593	*356-7613	*356-7613	358-7646	358-7646	*358-7668	*358-7669	*358-7693
		*358-7693								
TMFLAG	002140	#39-1165	*121-3035	*123-3079	*125-3126	*127-3170	328-6922			
TOOMAN	002472	#39-1254	*453-2049	460-2245	*461-2277					
TRAPVE	- 000034	#12-326	*48-1461	*48-1462						
TRT	= 000003	#502-3577	523-3969	547-4400						
TSK05A	052240	374-170	#374-201	374-215						
TSK13A	053100	380-302	#380-324							
TSK13B	053136	380-335	#382-338							
TSK20A	053602	386-386	#386-422							
TSTBAN	007606	68-1860	#68-1915							

SYMBOL	VALUE	REFERENCES
TSTDAT	002344	#39-1209 *207-4696 *207-4697 *207-4700 *207-4701 207-4702 207-4703 207-4704 *207-4710 *207-4712 207-4715 207-4717 207-4723 207-4729 *210-4790 *210-4791 210-4792 *210-4795 *210-4797 210-4801 210-4803 *213-4870 *213-4871 *213-4874 *213-4875 213-4881 *213-4884 *213-4886 *213-4888 *213-4890 213-4892 213-4894 *218-4942 *218-4943 *218-4946 *218-4947 218-4953 *218-4956 *218-4958 *218-4960 *218-4962 218-4965 218-4967 218-4973 218-4979 *221-5019 *221-5020 *221-5023 *221-5024 221-5030 *221-5033 *221-5035 *221-5037 *221-5039 221-5042 221-5045 221-5053 221-5058 *224-5098 *224-5099 *224-5102 *224-5103 224-5108 *224-5111 *224-5113 *224-5115 *224-5117 224-5120 224-5122 224-5129 224-5135 *259-5646 *259-5647 259-5648 *259-5664 *259-5666 *259-5668 *259-5669 *259-5671 *259-5674 *259-5675 *259-5677 *259-5679 *259-5680 *259-5682 261-5708 261-5710 448-1950 448-1955 453-2056 453-2058 561-4713 561-4713
TSTRD1	037434	291-6323 #291-6344
TSTREA	= 104510	#10-248 136-3348 136-3367 207-4739 207-4753 210-4811 210-4823
TST1	006260	#65-1689
TST2	007004	#66-1796
TST3	007160	#68-1833
TST4	010310	#72-2031
TST5	014342	#100-2710
TST6	014414	#103-2730
TST7	014456	#103-2740
TWOCSR	002600	#39-1289 *78-2141 *78-2149 289-6281 289-6292 *343-7217 *343-7219
TYPDS	104405	#10-171 97-2653 97-2655 97-2657 108-2806 352-7460 356-7620 356-7636 467-2375
TYPEIT	- 104401	#10-167 57-1582 57-1592 91-2474 91-2476 93-2522 93-2534 93-2541 97-2652 97-2654 97-2656 97-2658 108-2801 108-2803 132-3269 134-3296 134-3298 145-3570 274-5962 274-5963 274-5964 274-5970 274-5972 274-5973 274-5974 274-5975 274-5976 274-5977 274-5986 274-5987 274-5988 274-5989 277-6015 277-6018 277-6020 277-6029 277-6039 279-6049 279-6078 279-6089 279-6102 279-6112 279-6126 279-6135 279-6143 279-6145 314-6667 314-6688 339-7126 339-7129 339-7136 339-7141 341-7170 341-7196 343-7207 343-7211 343-7214 343-7221 343-7225 345-7234 345-7235 345-7257 345-7261 347-7273 347-7274 347-7297 347-7301 347-7304 347-7306 347-7313 349-7326 349-7327 349-7335 349-7339 349-7344 349-7349 349-7356 349-7364 349-7368 352-7455 352-7459 352-7461 352-7462 352-7476 352-7489 354-7499 354-7500 354-7507 354-7516 354-7518 354-7538 356-7553 356-7559 356-7573 356-7580 356-7589 356-7591 356-7621 356-7630 356-7637 358-7648 358-7649 358-7656 358-7665 358-7667 358-7687 360-7702 360-7711 360-7716 360-7722 360-7728 360-7734 362-7740 362-7745 362-7749 362-7759 362-7764 364-7782 402-778 408-893 457-2142 460-2221 460-2222 461-2268 463-2290 463-2310 463-2311 463-2313 463-2320 463-2322 465-2352 465-2362 467-2388 467-2414 467-2416 469-2428 469-2443 469-2454 469-2456 471-2497 473-2505 473-2514 473-2523 473-2534 475-2560 475-2568 475-2571 475-2574 475-2577 476-2585 476-2623 480-2683 480-2684 480-2692 480-2694 482-2706 482-2710 482-2712 482-2721 482-2724 482-2726 482-2730 482-2737 482-2740 482-2742 482-2746 482-2748 484-2764 484-2774 486-2849 487-2914 488-2958 488-2959 488-2961 488-2970 488-2975 488-2984 488-3002 490-3009 490-3014 490-3018 490-3020 490-3022 490-3027 491-3089 491-3098 491-3104 491-3109 491-3113 491-3118 491-3119 491-3121 491-3124 491-3128 492-3189 492-3191 492-3192 492-3193 492-3248 492-3250 492-3251 492-3252 498-3467
TYPOC	104402	#10-168 463-2295 467-2369 480-2691 480-2693 482-2711 482-2713 482-2725 482-2727 482-2741 482-2743 488-2960
TYPOS	104403	#10-169 91-2475 93-2535 93-2542 345-7254 347-7305 347-7314 356-7633 467-2400 467-2406 469-2448 469-2455 490-3015 490-3021 490-3026 490-3028
T12A	031700	#224-5092 226-5157
T12B	031722	#224-5096 226-5153
UDPARO	177660	#12-389 256-5641

SYMBOL	VALUE	REFERENCES								
UDPAR1	= 177662	#12-390	382-347	382-347						
UDPAR7	= 177676	#12-396								
UDPDR/	= 177636	#12-375	155-3822							
UIPAR0	- 177640	12-378	#12-379	322-6816	380-303	382-343	382-343			
UIPAR2	= 177644	#12-381	*68-1861	*68-1896	*170-4130	*178-4307	194-4510	264-5781	*271-5946	*370-134
UIPAR3	= 177646	#12-382	68-1882	170-4131	178-4308	370-135				
UIPAR4	= 177650	#12-383	320-6778	320-6795	*376-251					
UIPAR5	= 177652	#12-384	376-252							
UIPAR6	= 177654	#12-385	*68-1847	196-4533						
UIPAR7	= 177656	#12-386	*68-1848							
UIPDR0	= 177600	#12-358	322-6818	398-662	401-747					
UNITOP	002516	#39-1264	*76-2102	80-2167	80-2167	*97-2645	*97-2646	*97-2647	*97-2648	*97-2649
		97-2651	97-2651							
UNRELO	041604	112-2889	114-2923	116-2964	118-3005	121-3048	123-3097	125-3139	127-3188	172-4210
		#318-6718	334-7035	336-7073						
UPPFLG	002363	#39-1214	*218-4968	218-4983	*218-4985	*224-5123	226-5140	*226-5142		
UP2	056154	404-790	#404-793							
USERMA	042240	316-6698	318-6739	320-6773	#322-6815					
USESTK	= 000700	#12-258	61-1660	376-220	482-2738	482-2744				
USP	=%000006	#12-278	*61-1661	399-671	*402-761	482-2735				
WAITST	012034	84-2286	#86-2305							
WAITS	063674	434-1546	434-1563	#436-1600						
WAKEUP	054544	390-498	#392-558							
WARN1	007320	#68-1861								
WARN2	026522	#192-4465	*271-5933							
WARN3	026536	#192-4470	*271-5934							
WARN4	026562	#192-4482	*271-5935							
WARN5	026576	#192-4487	*271-5936							
WARN6	035364	#271-5946								
WARN7	024416	#170-4130								
WASDBE	- 1045C0	#10-240	70-1976	70-1985	70-1993	70-2001				
WASSBE	= 104476	#10-238	150-3669							
WAS1DB	- 104501	#10-241	213-4898							
WAS1SB	= 104477	#10-239	163-3990	163-3996	163-4003	163-4009				
WHICHC	050630	341-7188	343-7203	#364-7775						
WHOBOX	070672	467-2394	#476-2581							
WOOPEN	056512	404-802	404-805	404-807	406-821	406-842	#406-850	406-853		
WOOPS	056160	398-659	#404-795							
WOOPSA	056542	*404-800	*404-801	404-802	406-837	406-838	406-841	#406-853		
WOOPUP	056336	404-802	404-802	404-803	404-805	404-805	404-805	#406-820	406-842	406-843
		406-853								
WORST	002712	#43-1320	*48-1444	*116-2952	*118-2993	*123-3085	*127-3176	325-6907		
WRITEO	002502	#39-1258	*105-2779	*105-2782	178-4309	*368-85	*368-96	370-138	*376-227	376-255
		*376-258	*378-270	*378-276	*415-1181	*415-1183				
XXDPCH	002446	#39-1241	*53-1536	461-2267						
ZERO	002426	#39-1233								
ZEROS	002430	#39-1234	147-3641	147-3642	249-5495	249-5499				
$APTHD	075236	37-1096	#497-3436							
$AUTO	002066	#39-1144	*53-1528	*53-1532	63-565	488-2956				
$BANK	002015	#39-1123	*458-2177							
$BASE	075210	#497-3408								
$BELL	003003	#43-1353	354-7538	358-7687	460-2221					

SYMBOL	VALUE	REFERENCES								
$CACHF	037066	#286-6268	500-3504							
$CACHN	037050	#286-6262	500-3503							
$CBCSR	037700	#294-6389	500-3547							
$CB1CS	037742	#294-6396	500-3548							
$CDW1	075214	93-2547	93-2549	#497-3413						
$CDW2	075216	93-2547	93-2550	#497-3414						
$CHARC	057356	*408-895	*408-905	*408-939	#408-944					
$CHKDI	040354	#301-6489	500-3555							
$CHK1D	040410	#301-6496	500-3556							
$CKSWR	073022	#488-2931	500-3487							
$CLRCS	040322	#301-6480	500-3553							
$CLR1C	040340	#301-6484	500-3554							
$CMTAG	002000	#39-1114	46-1416							
$CMTGE	002700	#41-1311	46-1418							
$CNTLC	074224	488-2970	491-3089	#491-3140						
$CNTLG	074236	488-2958	#491-3142							
$CNTLU	074231	488-2975	491-3113	#491-3141						
$CPUOP	075162	#497-3381								
$CRLF	003010	#43-1355	97-2652	274-5972	274-5975	356-7637	408-894	463-2290	463-2313	463-2322
		480-2684	482-2710	482-2724	482-2740	482-2748	488-2984	490-3009	491-3118	
$DBLK	073012	487-2884	487-2914	#487-2922						
$DB20	075014	469-2441	#496-3331							
$DDW0	075220	55-1548	#497-3425							
$DDW1	075222	#497-3426								
$DDW2	075224	#497-3427								
$DDW3	075226	#497-3428								
$DDW4	075230	#497-3429								
$DDW5	075232	#497-3430								
$DDW6	075234	99-2701	99-2703	#497-3431						
$DEENE	037040	#286-6258	500-3499							
$DEVCT	075144	*108-2834	*457-2129	*457-2131	#497-3371					
$DEVM	075212	#497-3409								
$DOAGA	015040	108-2808	108-2810	#108-2831						
$DOAGN	015010	#108-2820								
$DOWN	055532	#399-705	399-706							
$DTBL	073002	487-2887	#487-2918							
$ECCDI	037466	#294-6355	500-3543							
$ECCIN	037554	#294-6367	500-3545							
$ECC1D	037522	#294-6361	500-3544							
$ECC1I	037574	#294-6372	500-3546							
$ENASB	037612	#294-6377	500-3557							
$ENA1S	037646	#294-6383	500-3558							
$ENDAD	015000	37-1087	53-1533	57-1581	#108-2816					
$ENERG	037030	#286-6254	500-3498							
$ENV	075154	53-1527	#497-3376							
$ENVM	075155	53-1520	53-1523	#497-3377						
$EOP	014662	#108-2796								
$ERFLG	002016	#39-1124	457-2162	*457-2168	*460-2215					
$ERROR	066662	48-1459	#460-2213							
$ERRTB	101372	463-2301	#549-4417							
$ERRTY	067324	460-2249	#463-2289							
$ERTTL	002754	#43-1337	80-2185	105-2774	108-2798	356-7620	356-7622	*460-2223	*460-2225	461-2267

SYMBOL	VALUE	REFERENCES								
$ESCAP	002454	#39-1247	*457-2171	461-2259	461-2261					
$ETABL	075154	#497-3375								
$ETEND	075236	#497-3432	497-3442							
$EXHAL	043546	#336-7058								
$FATAL	075136	*460-2241	#497-3368							
$FILLC	003002	#43-1352	408-898	543-4290						
$FILLS	002451	#39-1244	*360-7706	543-4292						
$GTSWR	073160	#488-2959	500-3486							
$HALT	067136	#461-2254								
$HALT2	075312	#498-3468								
$HIBTS	075236	#497-3437								
$HIOCT	074434	345-7237	347-7276	356-7561	*492-3184	#492-3195				
$ILLUP	056134	398-646	401-712	#402-782	402-783					
$INVAL	040510	#303-6519	500-3560							
$ITEMB	002017	#39-1125	*460-2232	463-2292						
$KERNE	037020	#286-6250	500-3497							
$KMAP	041016	#311-6628	500-3501							
$LF	003011	#43-1356	491-3128							
$LOADC	037076	#289-6275	500-3506							
$LOAD1	037146	289-6279	#289-6288							
$LPADR	002746	#43-1334	*48-1454	183-4337	*183-4347	183-4348	*183-4364	186-4371	*186-4381	186-4382
		*186-4398	*457-2166	*457-2169	457-2173					
$LPERR	002750	#43-1335	*48-1455	183-4337	*183-4348	*183-4364	186-4371	*186-4382	*186-4398	457-2166
		*457-2170	461-2257							
$MADR1	075166	#497-3395								
$MADR2	075172	#497-3399								
$MADR3	075176	#497-3402								
$MADR4	075202	#497-3405								
$MAIL	075134	#497-3366	497-3438	497-3442						
$MAMS1	075164	99-2667	#497-3388							
$MAMS2	075170	#497-3397								
$MAMS3	075174	#497-3400								
$MAMS4	075200	#497-3403								
$MBADR	075240	#497-3438								
$MNEW	074254	488-2961	#491-3144							
$MSGAD	075150	#497-3373								
$MSGLG	075152	#497-3374								
$MSGTY	075134	*461-2264	#497-3367							
$MSWR	074243	488-2959	#491-3143							
$MTYP1	075165	#497-3389								
$MTYP2	075171	#497-3398								
$MTYP3	075175	#497-3401								
$MTYP4	075201	#497-3404								
$NOTRA	075306	#498-3467	500-3482	500-3484	500-3536	500-3537	500-3538	500-3539	500-3540	500-3541
		500-3561	500-3562	500-3563	500-3564	500-3565	500-3566	500-3567	500-3568	
$NULL	002450	#39-1243	408-900							
$NWTST	000001	#65-1689	65-1689	#65-1689	#66-1796	66-1796	#66-1796	#68-1833	68-1833	#68-1833
		#72-2031	72-2031	#72-2031	#100-2710	100-2710	#100-2710	#103-2730	103-2730	#103-2730
		#103-2740	103-2740	#103-2740						
$OCNT	072572	*486-2821	*486-2850	#486-2863						
$OCTVL	075116	496-3333	#496-3358	496-3361						
$OCT8	075122	469-2443	#496-3361							

CROSS REFERENCE CREF V01

SYMBOL	VALUE	REFERENCES								
$OMODE	C72574	*486-2816	*486-2820	486-2825	*486-2828	*486-2839	#486-2865			
$OVER	066502	457-2148	457-2167	#457-2172						
$PASS	075142	*53-1519	*93-2557	*108-2799	*108-2800	108-2806	108-2831	*108-2837	159-3889	159-3898
		159-3906	159-3916	161-3927	161-3936	163-3951	166-4092	#497-3370		
$PASTM	075244	#497-3440								
$PATMA	002014	#39-1122	402-774	402-775	*458-2178	*458-2187	*458-2190	*458-2191	458-2192	458-2193
		460-2218								
$PER01	064574	#446-1883	500-3509							
$PER02	064622	#446-1889	500-3510							
$PER03	064650	#446-1895	500-3511							
$PER04	064700	#446-1901	500-3512							
$PER07	064762	#446-1917	500-3513							
$PER10	065004	#446-1922	500-3514							
$PER11	065034	#446-1927	500-3515							
$PER12	065054	#446-1932	500-3516							
$PER13	065076	#448-1938	500-3517							
$PER14	065116	#448-1943	500-3518							
$PER15	065140	#448-1948	500-3519							
$PER16	065162	#448-1953	500-3520							
$PER17	065202	#448-1958	500-3521							
$PER20	065220	#448-1963	500-3522							
$PER21	065236	#448-1968	500-3523							
$PER22	065256	#448-1973	500-3524							
$PER23	065274	#448-1978	500-3525							
$PER24	065312	#448-1983	500-3526							
$PER25	054570	#394-569	500-3527							
$PER26	065502	#451-2020	500-3528							
$PER27	065522	#451-2024	500-3529							
$PER30	054762	#396-605	500-3530							
$PER31	065720	#453-2064	500-3531							
$PER32	066016	#455-2082	500-3532							
$PER33	066064	#455-2091	500-3533							
$PER34	066144	#455-2102	500-3534							
$PER35	066176	#455-2111	500-3535							
$PWRDN	055160	48-1463	#398-638	402-777						
$PWRUP	055536	399-704	#401-711	406-849						
$QUES	003007	#43-1354	488-3002	491-3121						
$RAND	074720	388-438	#494-3302							
$RDCHR	073602	#491-3053	500-3489							
$RDDEC	074436	#492-3210	500-3492							
$RDLIN	073722	#491-3080	500-3490							
$RDOCT	074266	#492-3159	500-3491							
$READC	037220	#291-6304	500-3507							
$RESRE	074662	#493-3283	500-3495							
$SAVRE	074624	#493-3272	500-3494							
$SAVR6	056140	*399-702	401-714	*401-715	*401-716	#402-784	406-832			
$SCOPE	066232	48-1457	#457-2129							
$STN	= 000001	#65-1689	#66-1796	#68-1833	#72-2031	#100-2710	#103-2730	#103-2740		
$SVLAD	066466	457-2156	457-2163	#457-2169						
$SWR	= 163000	#8-131	65-1689	66-1796	68-1833	72-2031	100-2710	103-2730	103-2740	
$SWREG	075156	53-1525	#497-3379							
$TESTN	075140	*460-2218	#497-3369							

SYMBOL	VALUE	REFERENCES								
$TKB	002774	#43-1349	274-5958	274-5994	349-7371	349-7432	352-7465	352-7475	354-7521	354-7543
		356-7594	356-7612	358-7670	358-7692	488-2936	488-2966	490-3037	491-3057	491-3063
$TKS	002772	#43-1348	274-5960	274-5993	349-7373	349-7430	352-7467	352-7473	354-7523	354-7542
		356-7596	356-7611	358-7672	358-7691	488-2934	488-2964	490-3035	491-3055	491-3061
$TN	= 000010	#8-132	65-1689	65-1689	#65-1689	66-1796	66-1796	#66-1796	68-1833	68-1833
		#68-1833	72-2031	72-2031	#72-2031	100-2710	100-2710	#100-2710	103-2730	103-2730
		#103-2730	103-2740	103-2740	#103-2740					
$TPB	003000	#43-1351	408-935							
$TPFLG	002452	#39-1245	*53-1521	408-877						
$TPS	002776	#43-1350	408-933							
$TRAP	075252	48-1461	#498-3452							
$TRAP2	075274	#498-3463	500-3478							
$TRPAD	075314	498-3457	#500-3478							
$TSTM	075242	#497-3439								
$TSTRD	037310	#291-6322	500-3559							
$TTYIN	074200	491-3082	491-3083	491-3101	491-3119	491-3133	#491-3137			
$TYPDS	072576	#487-2877	500-3483							
$TYPE	056752	#408-877	500-3479							
$TYPEC	057076	408-897	408-904	#408-907	484-2768	488-2988				
$TYPEX	057360	408-940	408-942	#408-945						
$TYPOC	072374	#486-2819	500-3480							
$TYPON	072410	486-2818	#486-2821							
$TYPOS	072350	#486-2814	500-3481							
$UNIT	075146	*108-2835	*457-2132	#497-3372						
$UNITM	075246	#497-3441								
$USWR	075160	108-2831	#497-3380							
$VECT1	075204	#497-3406								
$VECT2	075206	#497-3407								
$WASDB	040146	#299-6441	500-3551							
$WASSB	040002	#297-6406	500-3549							
$WAS1D	040262	#299-6467	500-3552							
$WAS1S	040116	#297-6432	500-3550							
$XTSTR	066370	#457-2150								
$ZAP42	014760	#108-2809	461-2271							
$OFILL	072573	*486-2815	*486-2819	486-2829	#486-2864					