11/70–74

11/70 – 74 UNIBUS MAP

CEKBFC0

AH-7980C-MC

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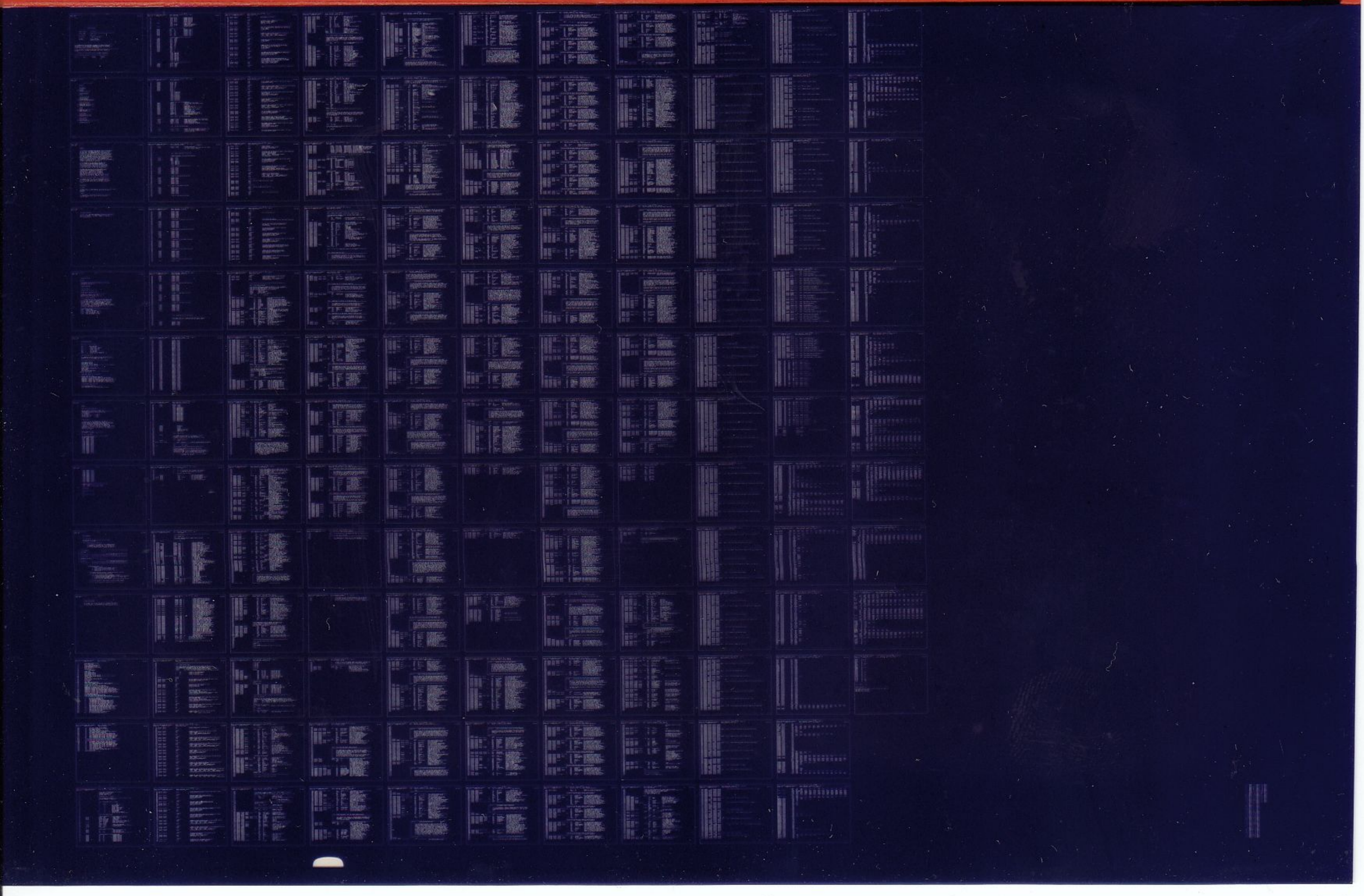

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IDENTIFICATION

PRODUCT CODE: AC-7979C-MC

PRODUCT NAME: CEKBFC0 PDP-11/70-74MP UNIBUS MAP DIAGNOSTIC

DATE CREATED: MAY, 1979

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHORS: DALE A. ROEDGER
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ERNEST M. PREISIG

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1. ABSTRACT

THIS PROGRAM IS DESIGNED TO BE RUN ON A PDP11/70-74MP ON WHICH THE CPU, CACHE, AND MEMORY MANAGEMENT DIAGNOSTIC PROGRAMS HAVE BEEN RUN. THE PROGRAM WILL DETECT ALL ERRORS THAT ORIGINATE WITH THE MAP BOX AND PROVIDE LOOPING CAPABILITIES SO THAT THE FIELD SERVICE ENGINEER CAN VERIFY THE FAILURES. THERE MAY BE SOME CASES, SUCH AS THE CACHE REGISTER DATA PATH, AND CACHE MEMORY DATA PATH, WHERE INTERACTION BETWEEN MODULES PROHIBITS CLOSE ISOLATION, BUT THE FAILING FUNCTION WILL BE CALLED OUT SO THE FIELD SERVICE ENGINEER CAN COMPLETE THE ISOLATION PROCESS. THIS PROGRAM ALSO PROVIDES DIAGNOSTIC COVERAGE FOR THE 'CACHE BYPASS' FUNCTION ON MAP PAGE FOR KB11-CM AND SUBSEQUENT PROCESSORS.

IF THE PROGRAM CATCHES AN ERROR IN AN EARLY TEST AND IS ALLOWED TO CONTINUE RUNNING THROUGH THE LATER TESTS THE ERROR INDICATIONS FROM THOSE LATER TESTS MAY BE INVALID. THIS IS DUE TO THE STRUCTURE OF THE PROGRAM, WHICH ASSUMES THAT ALL AREAS TESTED PRIOR TO THE CURRENT TEST ARE FUNCTIONING PROPERLY.

THE ERROR TYPE OUTS WILL BE IN TABLE FORMAT, WITH A MESSAGE INDICATING THE CLASS OF ERROR, A HEADER IDENTIFYING EACH COLUMN AND A REPORT OF ALL PERTINENT DATA. WHEN THE TEST CAN PRODUCE MORE THAN ONE ERROR CONDITION, A SUMMARY OF ERRORS WILL BE GIVEN AT THE END OF THAT TEST CONSISTING OF: THE LOGICAL 'AND' AND 'OR' OF THE DATA PREVIOUSLY REPORTED AND THE NUMBER OF ERRORS IN THIS TEST.
(SEE SECTION 6.3 FOR AN EXAMPLE OF THE ERROR TYPEOUTS.)

THE PROGRAM LOADS ''044'' INTO THE MICRO BREAK REGISTER (17777770) SO THAT A SYNC PULSE IS GENERATED ON PIN # AE1 SLOT10 EVERY TIME A ''NOP'' IS EXECUTED. THIS SHOULD HELP IN ISOLATING THE EXACT TIMING OF BAD OR MISSING SIGNALS.

2. REQUIREMENTS

2.1 EQUIPMENT

THE BASIC PDP-11/70-74MP COMPUTER, INCLUDING THE CPU, CACHE, MEMORY MANAGEMENT, AND AN LA-30 OR EQUIVALENT DEVICE FOR ERROR MESSAGES.

2.2 STORAGE

THIS PROGRAM WILL REQUIRE 8K TO LOAD BUT WILL UTILIZE ALL EXISTING CORE FOR A DUAL ADDRESSING TEST OF MEMORY FROM THE UNIBUS.

2.3 PRELIMINARY PROGRAMS

THE CPU, CACHE, AND MEMORY MANAGEMENT DIAGNOSTICS SHOULD BE RUN
BEFORE THIS PROGRAM. THE MEMORY DIAGNOSTIC SHOULD AT LEAST,
MAKE A QUICK VERIFY OF THE AREA OF MEMORY THIS PROGRAM
WILL LOAD AND RUN IN.

3. LOADING PROCEDURE

3.1 METHOD.

THIS PROGRAM CAN BE LOADED FROM ANY DEVICE THAT IS SUPPORTED BY XXDP AND SHOULD BE LOADED USING THE XXDP PROCEDURE FOR THAT DEVICE.

4. STARTING PROCEDURE

4.1 STARTING ADDRESS

PROGRAM STARTS AT ADDRESS 200

4.2 PROGRAM AND/OR OPERATOR ACTION

PROGRAM WILL IDENTIFY ITSELF AND AT THE END OF EACH PASS WILL INDICATE THE TOTAL NUMBER OF ERRORS OCCURRING ON THAT PASS.

4.3 SPECIAL STARTING PROCEDURE

IF IT APPEARS THAT THE CACHE IS CAUSING SOME TROUBLE AND YOU STILL WANT TO RUN THIS PROGRAM, IT IS POSSIBLE TO RUN WITH THE CACHE DISABLED. SIMPLY LOAD THE CACHE CONTROL REGISTER (17777746) WITH THE DESIRED NUMBER. THEN LOAD THE PC (17777707) WITH THE STARTING ADDRESS (200) AND PRESS "CONTINUE". THE PROGRAM WILL NOW RUN NORMALLY EXCEPT THAT CERTAIN TESTS WILL BE SKIPPED SINCE THE CACHE IS DISABLED. THIS FACT IS INDICATED IN THE ABSTRACT OF EACH TEST THAT CHECKS THE CACHE CONTROL REGISTER.

DEFINITION OF THE BITS IN THE CACHE CONTROL REGISTER:
BIT00 -DISABLE TRAPS
BIT01 -DISABLE UNIBUS TRAPS
BIT02 -FORCE MISS ON READ, GROUP 0
BIT03 -FORCE MISS ON READ, GROUP 1
BIT04 -FORCE REPLACEMENT IN GROUP 0
BIT05 -FORCE REPLACEMENT IN GROUP 1

5. OPERATING PROCEDURE

5.1 OPERATIONAL SWITCH SETTINGS

```
SW15    1=      HALT ON ERROR
SW14    1=      LOOP ON TEST
SW13    1=      INHIBIT ERROR TYPEOUTS
SW12    1=      INHIBIT TRACE TRAP
SW11    1=      INHIBIT ITERATIONS
SW10    1=      BELL ON ERROR
SW09    1=      LOOP ON ERROR
SW08    1=      LOOP ON TEST IN SWR<06:00>
SW07    1=      INHIBIT MULTIPLE ERROR TYPE OUTS
```

5.2 SUB-ROUTINE ABSTRACTS

ALL SUBROUTINE ABSTRACTS APPEAR IN THE CODE BEFORE THEIR EXPANSION AND IN THE DOCUMENT THAT IMMEDIATELY FOLLOWS THIS. BELOW IS A LIST OF THE SUBROUTINE TITLES.

5.2.1 MACRO LIBRARY SUBROUTINES (FOUND IN MOST PROGRAMS)

SCOPE HANDLER ROUTINE
ERROR HANDLER ROUTINE
ERROR MESSAGE TYPE OUT ROUTINE
CONVERT 16-BIT VIRTUAL ADDRESSES TO 22-BIT PHYSICAL ADDRESSES
SAVE AND RESTORE R0-R5 ROUTINES
TYPE ROUTINE
BINARY TO OCTAL (ASCII) AND TYPE
CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
TRAP DECODER
POWER DOWN AND UP ROUTINES
DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE
END OF PASS ROUTINE

5.2.2 SUBROUTINES UNIQUE TO THIS PROGRAM

TURN OFF AND SAVE T-BIT
RESTORE T-BIT TO ITS PREVIOUS CONDITION
SUBROUTINE TO LOG AND REPORT TIMEOUTS OF MAP REGISTERS
SUBROUTINE TO REPORT MAP REGISTERS THAT WILL NOT HOLD ZERO
SUBROUTINE TO REPORT DUAL ADDRESSING WHEN LOADING A MAP REGISTER
SUBROUTINE TO REPORT COUNT PATTERN ERRORS IN MAP REGISTERS
SUBROUTINE TO REPORT COUNT PATTERN ERRORS ON UNIBUS DATA PATH
SUBROUTINE TO REPORT COUNT PATTERN ERRORS IN CACHE REGISTERS

5.2.3 TRAP AND ABORT HANDLER ROUTINES

CPU TRAP HANDLER ROUTINE
CACHE TRAPS AND ABORTS HANDLER ROUTINE
MEMORY MANAGEMENT TRAPS AND ABORTS HANDLER ROUTINE

6. ERRORS

6.1 ERROR HALTS AND DESCRIPTION

WHEN AN ERROR IS DETECTED AN 'ERROR' (EMT)
INSTRUCTION IS EXECUTED AND THE 'ERROR HANDLER ROUTINE'
CHECKS THE SWITCH REGISTER FOR MODE SELECTED.
THE PROGRAM WILL:

HALT ON ERROR	IF SW15=1
INHIBIT ERROR TYPE OUT	IF SW13=1
RING BELL ON ERROR	IF SW10=1
LOOP ON ERROR	IF SW9=1

6.2 ERROR RECOVERY

IF SWITCH 9 IS UP, THE PROGRAM WILL LOOP BACK TO
THE POINT WHERE THE INSTRUCTION THAT CAUSED THE ERROR WAS
EXECUTED, WITHOUT ALLOWING ANY OF THE CONDITIONS TO CHANGE.
THIS WILL PROVIDE THE TIGHTEST POSSIBLE SCOPE LOOP.
IF SWITCH 9 IS DOWN, EACH ERROR WILL BE REPORTED AND
LOGGED AND, AT THE END OF EACH TEST, A SUMMARY OF ALL ERRORS
OCCURRING IN THAT TEST WILL BE PROVIDED. THE SUMMARY
CONSISTS OF THE LOGICAL 'AND' AND 'OR' OF THE ADDRESS AND/OR
DATA THAT WAS WRONG.

6.3 SAMPLE ERROR TYPE OUTS

SEE '$ERRTB:' FOR SAMPLE ERROR TYPEOUTS.

6.3.1 MULTIPLE TYPE ERRORS

THE FOLLOWING REGISTERS TIMED OUT WHEN REFERENCED

REG.ADR	TESTNO	ERRORPC
170210	000001	015226
170212	000001	015232
170214	000001	015232
170216	000001	015232
170230	000001	015232
170232	000001	015232
170234	000001	015232
170236	000001	015232
170250	000001	015232
170252	000001	015232
170254	000001	015232
170256	000001	015232
170270	000001	015232
170272	000001	015232
170274	000001	015232
170276	000001	015232
170310	000001	015232
170312	000001	015232

```
170314  000001  015232
170316  000001  015232
170330  000001  015232
170332  000001  015232
170334  000001  015232
170336  000001  015232
170350  000001  015232
170352  000001  015232
170354  000001  015232
170356  000001  015232
170370  000001  015232
170372  000001  015232
170374  000001  015232
170376  000001  015232

SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ
REGADRS REGADRS
 ''DR''    ''AND''  #ERRORS TESTNO  ERRORPC
170376  170210       32  000001  010530
```

7. RESTRICTIONS

7.1 STARTING RESTRICTIONS

NONE

7.2 OPERATING RESTRICTIONS

NONE

8. MISCELLANEOUS

8.1 EXECUTION TIME

THE RUN TIME FOR A SINGLE PASS WITH NO ITERATIONS IS APPROXIMATELY 10 SECONDS.

8.2 ADDRESS GENERATION IN THE PDP-11/70

THE FOLLOWING IS AN EXAMPLE OF HOW A MEMORY ADDRESS IS GENERATED BY THE UNIBUS MAP. THIS ASSUMES THAT THE ADDRESS ORIGINATES IN THE CPU BUT THE PROCESS CAN APPLY TO ANY UNIBUS ADDRESS, STARTING AT LINE C2.

```
A.  VIRTUAL ADDRESS                        15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00

A1. PAGE NUMBER (0-7)                      15 14 13

A2. OFFSET                                    12 11 10 09 08 07 06 05 04 03 02 01 00
B.  P.A.R.[PAGE NO.] +  15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00
                        ---------------------------------------------------------------
C.  PHYSICAL ADDR.      21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00

C1. 17XXXXXX=> U.B.ADR. 21 20 19 18
C2. MAPPING REG.NO.(0-36)           17 16 15 14 13

C3. OFFSET                                    12 11 10 09 08 07 06 05 04 03 02 01 00
D.  MAP REG.[NO.]    +  21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01
                        ---------------------------------------------------------------
E.  PHYSICAL ADDR.      21 20 19 18 17 16 15 14 13 12 11 10 09 08 07 06 05 04 03 02 01 00
```

DESCRIPTION OF LINES:

A: VIRTUAL ADDRESS (16 BITS)
- A1: UPPER 3 BITS OF VIRTUAL ADDRESS, USED TO SELECT A PAGE ADDRESS REGISTER (PAR)
- A2: LOWER 13 BITS OF VIRTUAL ADDRESS, ADDED TO SELECTED PAR

B: PAGE ADDRESS REGISTER (16 BITS), IN ADDITION PROCESS THIS GETS LEFT SHIFTED 6 BITS BEFORE ADDITION TO A2

C: PHYSICAL ADDRESS CREATED BY MEMORY MANAGEMENT, (22 BITS)
- C1: IF UPPER 4 BITS ARE ALL ONES THEN BITS <17:00> GO OUT ON UNIBUS
- C2: IF MAP RELOCATION IS ENABLED THEN BITS <17:13> SELECT ONE OF THE 36 (OCTAL) MAP REGISTERS.
- C3: LOWER 13 BITS OF UNIBUS ADDRESS, ADDED TO SELECTED MAP REGISTER

D: MAP REGISTER (22 BITS), ADDED TO BITS <12:00> OF UNIBUS ADDRESS

E: PHYSICAL ADDRESS GENERATED BY UNIBUS MAP AND SENT TO THE CACHE.

9. PROGRAM DESCRIPTION
------- -----------

THE DOCUMENT THAT FOLLOWS THIS ONE HAS A PARAGRAPH DESCIRBING
EACH OF THE TESTS. THE PARAGRAPH WILL INDICATE IF THE TEST IS
RUN CONDITIONALLY ON THE STATUS ON THE CACHE CONTROL REGISTER.

@
.END

```
                        .TITLE  PDP-11/70-74MP UNIBUS MAP DIAGNOSTIC
                        ;*COPYRIGHT (C) 1975,1979
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY DALE A. ROEDGER
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-A5).
                        ;*

                        .SBTTL  OPERATIONAL SWITCH SETTINGS
                        ;*
                        ;*      SWITCH                  USE
                        ;*      ------          --------------------
                        ;*        15            HALT ON ERROR
                        ;*        14            LOOP ON TEST
                        ;*        13            INHIBIT ERROR TYPEOUTS
                        ;*        12            INHIBIT TRACE TRAP
                        ;*        11            INHIBIT ITERATIONS
                        ;*        10            BELL ON ERROR
                        ;*         9            LOOP ON ERROR
                        ;*         8            LOOP ON TEST IN SWR<6:0>
                        ;*         7            INHIBIT MULTIPLE ERROR TYPEOUTS

                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                  STACK=  1100            ;;FIRST ADDRESS OF THE STACK
001100                  KERSTK= STACK           ;;KERNEL STACK
000700                  SUPSTK= STACK-200       ;;SUPERVISOR STACK
000600                  USESTK= STACK-300       ;;USER STACK
                        .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                        .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL
177776                  PS=     177776          ;;PROCESSOR STATUS WORD
                        .EQUIV  PS,PSW
177774                  STKLMT= 177774          ;;STACK LIMIT REGISTER
177772                  PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
177570                  SWR=    177570          ;;SWITCH REGISTER
177570                  DISPLAY=SWR

                        ;*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
000000                  R0=     %0              ;;GENERAL REGISTER
000001                  R1=     %1              ;;GENERAL REGISTER
000002                  R2=     %2              ;;GENERAL REGISTER
000003                  R3=     %3              ;;GENERAL REGISTER
000004                  R4=     %4              ;;GENERAL REGISTER
000005                  R5=     %5              ;;GENERAL REGISTER
000006                  R6=     %6              ;;GENERAL REGISTER
000007                  R7=     %7              ;;GENERAL REGISTER
```

```
                                .EQUIV  R0,R10          ;;GENERAL REGISTER
                                .EQUIV  R1,R11          ;;GENERAL REGISTER
                                .EQUIV  R2,R12          ;;GENERAL REGISTER
                                .EQUIV  R3,R13          ;;GENERAL REGISTER
                                .EQUIV  R4,R14          ;;GENERAL REGISTER
                                .EQUIV  R5,R15          ;;GENERAL REGISTER
000006                          SP=%6                   ;;STACK POINTER
                                .EQUIV  SP,KSP          ;;KERNEL STACK POINTER
                                .EQUIV  SP,SSP          ;;SUPERVISOR STACK POINTER
                                .EQUIV  SP,USP          ;;USER STACK POINTER
000007                          PC=%7                   ;;PROGRAM COUNTER

                                ;*PRIORITY LEVEL DEFINITIONS
000000                          PR0=    0               ;;PRIORITY LEVEL 0
000040                          PR1=    40              ;;PRIORITY LEVEL 1
000100                          PR2=    100             ;;PRIORITY LEVEL 2
000140                          PR3=    140             ;;PRIORITY LEVEL 3
000200                          PR4=    200             ;;PRIORITY LEVEL 4
000240                          PR5=    240             ;;PRIORITY LEVEL 5
000300                          PR6=    300             ;;PRIORITY LEVEL 6
000340                          PR7=    340             ;;PRIORITY LEVEL 7

                                ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
100000                          SW15=   100000
040000                          SW14=   40000
020000                          SW13=   20000
010000                          SW12=   10000
004000                          SW11=   4000
002000                          SW10=   2000
001000                          SW09=   1000
000400                          SW08=   400
000200                          SW07=   200
000100                          SW06=   100
000040                          SW05=   40
000020                          SW04=   20
000010                          SW03=   10
000004                          SW02=   4
000002                          SW01=   2
000001                          SW00=   1
                                .EQUIV  SW09,SW9
                                .EQUIV  SW08,SW8
                                .EQUIV  SW07,SW7
                                .EQUIV  SW06,SW6
                                .EQUIV  SW05,SW5
                                .EQUIV  SW04,SW4
                                .EQUIV  SW03,SW3
                                .EQUIV  SW02,SW2
                                .EQUIV  SW01,SW1
                                .EQUIV  SW00,SW0

                                ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                          BIT15=  100000
040000                          BIT14=  40000
020000                          BIT13=  20000
010000                          BIT12=  10000
004000                          BIT11=  4000
```

```
                        ;C 2
000020          BIT10=  2000
000010          BIT09=  1000
000004          BIT08=  400
000002          BIT07=  200
000001          BIT06=  100
                BIT05=  40
                BIT04=  20
                BIT03=  10
                BIT02=  4
                BIT01=  2
                BIT00=  1
                .EQUIV  BIT09,BIT9
                .EQUIV  BIT08,BIT8
                .EQUIV  BIT07,BIT7
                .EQUIV  BIT06,BIT6
                .EQUIV  BIT05,BIT5
                .EQUIV  BIT04,BIT4
                .EQUIV  BIT03,BIT3
                .EQUIV  BIT02,BIT2
                .EQUIV  BIT01,BIT1
                .EQUIV  BIT00,BIT0

                ;*BASIC ''CPU'' TRAP VECTOR ADDRESSES
000004          ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010          RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014          TBITVEC=14              ;;''T'' BIT
000014          TRTVEC= 14              ;;TRACE TRAP
000014          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
000064          TPVEC=  64              ;;TTY PRINTER VECTOR
000114          CACHVEC=114             ;;CACHE ERROR INTERRUPT VECTOR
000240          PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
000250          MMVEC=  250             ;;MEMORY MANAGEMENT VECTOR

                .SBTTL  CACHE   REGISTER DEFINITIONS


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
177752          HITMIS = 177752         ;;HIT MISS REGISTER ''1'' IMPLIES HIT IN CACHE


                .SBTTL  CPU REGISTER DEFINITIONS


177760          SIZELO = 177760         ;;MEMORY SIZE REGISTER NUMBER TO PUT INTO A PAR
                                        ;;TO GET TO THE LAST 32 WORDS OF MEMORY
177762          SIZEHI = 177762         ;;HIGH SIZE REGISTER, RESERVED FOR FUTURE USE
                                        ;;CURRENTLY ALL ZERO
```

```
                                                D 2
                        SYSTID = 177764         ;;SYSTEM ID REGISTER
                        CPUERR = 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED
                                                ;;THE TRAP TO ERRVEC (000004)



                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES

                        MMR0=   177572
                        MMR1=   177574
                        MMR2=   177576
                        MMR3=   172516
                        .EQUIV  MMR0,SR0
                        .EQUIV  MMR1,SR1
                        .EQUIV  MMR2,SR2
                        .EQUIV  MMR3,SR3

                        ;*USER ''I'' PAGE DESCRIPTOR REGISTERS

                        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
                        UDPDR7= 177636

                        ;*USER ''I'' PAGE ADDRESS REGISTERS

                        UIPAR0= 177640
                        UIPAR1= 177642
                        UIPAR2= 177644
                        UIPAR3= 177646
                        UIPAR4= 177650
                        UIPAR5= 177652
                        UIPAR6= 177654
                        UIPAR7= 177656

                        ;*USER 'D'' PAGE ADDRESS REGISTERS
```

```
                    177660          UDPAR0= 177660
                    177662          UDPAR1= 177662
                    177664          UDPAR2= 177664
                    177666          UDPAR3= 177666
                    177670          UDPAR4= 177670
                    177672          UDPAR5= 177672
                    177674          UDPAR6= 177674
                    177676          UDPAR7= 177676

                                    ;*SUPERVISOR ''I'' PAGE DESCRIPTOR REGISTERS

                    172200          SIPDR0= 172200
                    172202          SIPDR1= 172202
                    172204          SIPDR2= 172204
                    172206          SIPDR3= 172206
                    172210          SIPDR4= 172210
                    172212          SIPDR5= 172212
                    172214          SIPDR6= 172214
                    172216          SIPDR7= 172216

                                    ;*SUPERVISOR ''D'' PAGE DESCRIPTOR REGISTERS

                    172220          SDPDR0= 172220
                    172222          SDPDR1= 172222
                    172224          SDPDR2= 172224
                    172226          SDPDR3= 172226
                    172230          SDPDR4= 172230
                    172232          SDPDR5= 172232
                    172234          SDPDR6= 172234
                    172236          SDPDR7= 172236

                                    ;*SUPERVISOR ''I'' PAGE ADDRESS REGISTERS

                    172240          SIPAR0= 172240
                    172242          SIPAR1= 172242
                    172244          SIPAR2= 172244
                    172246          SIPAR3= 172246
                    172250          SIPAR4= 172250
                    172252          SIPAR5= 172252
                    172254          SIPAR6= 172254
                    172256          SIPAR7= 172256

                                    ;*SUPERVISOR ''D'' PAGE ADDRESS REGISTERS

                    172260          SDPAR0= 172260
                    172262          SDPAR1= 172262
                    172264          SDPAR2= 172264
                    172266          SDPAR3= 172266
                    172270          SDPAR4= 172270
                    172272          SDPAR5= 172272
                    172274          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
                        KDPDR7= 172336

                        ;*KERNEL ''I'' PAGE ADDRESS REGISTERS

                        KIPAR0= 172340
                        KIPAR1= 172342
                        KIPAR2= 172344
                        KIPAR3= 172346
                        KIPAR4= 172350
                        KIPAR5= 172352
                        KIPAR6= 172354
                        KIPAR7= 172356

                        ;*KERNEL 'D'' PAGE ADDRESS REGISTERS

                        KDPAR0= 172360
                        KDPAR1= 172362
                        KDPAR2= 172364
                        KDPAR3= 172366
                        KDPAR4= 172370
                        KDPAR5= 172372
                        KDPAR6= 172374
                        KDPAR7= 172376


                        .SBTTL  UNIBUS MAP REGISTER DEFINITIONS


                        ;*THE LOWER 16 BITS OF THE MAP REGISTERS ARE LABELED 'MAPLXX'
                        ;*THE UPPER 6 BITS OF THE MAP REGISTERS ARE LABELED 'MAPHXX'


                        MAPL00 = 170200
                        MAPH00 = 170202
                        MAPL01 = 170204
                        MAPH01 = 170206
                        MAPL02 = 170210
```

```
  337          170212          MAPH02 = 170212
  338          170214          MAPL03 = 170214
  339          170216          MAPH03 = 170216
  340          170220          MAPL04 = 170220
  341          170222          MAPH04 = 170222
  342          170224          MAPL05 = 170224
  343          170226          MAPH05 = 170226
  344          170230          MAPL06 = 170230
  345          170232          MAPH06 = 170232
  346          170234          MAPL07 = 170234
  347          170236          MAPH07 = 170236
  348          170240          MAPL10 = 170240
  349          170242          MAPH10 = 170242
  350          170244          MAPL11 = 170244
  351          170246          MAPH11 = 170246
  352          170250          MAPL12 = 170250
  353          170252          MAPH12 = 170252
  354          170254          MAPL13 = 170254
  355          170256          MAPH13 = 170256
  356          170260          MAPL14 = 170260
  357          170262          MAPH14 = 170262
  358          170264          MAPL15 = 170264
  359          170266          MAPH15 = 170266
  360          170270          MAPL16 = 170270
  361          170272          MAPH16 = 170272
  362          170274          MAPL17 = 170274
  363          170276          MAPH17 = 170276
  364          170300          MAPL20 = 170300
  365          170302          MAPH20 = 170302
  366          170304          MAPL21 = 170304
  367          170306          MAPH21 = 170306
  368          170310          MAPL22 = 170310
  369          170312          MAPH22 = 170312
  370          170314          MAPL23 = 170314
  371          170316          MAPH23 = 170316
  372          170320          MAPL24 = 170320
  373          170320          MAPH24 = 170320
  374          170324          MAPL25 = 170324
  375          170326          MAPH25 = 170326
  376          170330          MAPL26 = 170330
  377          170332          MAPH26 = 170332
  378          170334          MAPL27 = 170334
  379          170336          MAPH27 = 170336
  380          170340          MAPL30 = 170340
  381          170342          MAPH30 = 170342
  382          170344          MAPL31 = 170344
  383          170346          MAPH31 = 170346
  384          170350          MAPL32 = 170350
  385          170352          MAPH32 = 170352
  386          170354          MAPL33 = 170354
  387          170356          MAPH33 = 170356
  388          170360          MAPL34 = 170360
  389          170362          MAPH34 = 170362
  390          170364          MAPL35 = 170364
  391          170366          MAPH35 = 170366
  392          170370          MAPL36 = 170370
```

```
                                                H 2
  393            170372                 MAPH36 = 170372
  394            170374                 MAPL37 = 170374
  395            170376                 MAPH37 = 170376
  396                                   .EQUIV  MAPL00,MAPL0
  397                                   .EQUIV  MAPH00,MAPH0
  398                                   .EQUIV  MAPL01,MAPL1
  399                                   .EQUIV  MAPH01,MAPH1
  400                                   .EQUIV  MAPL02,MAPL2
  401                                   .EQUIV  MAPH02,MAPH2
  402                                   .EQUIV  MAPL03,MAPL3
  403                                   .EQUIV  MAPH03,MAPH3
  404                                   .EQUIV  MAPL04,MAPL4
  405                                   .EQUIV  MAPH04,MAPH4
  406                                   .EQUIV  MAPL05,MAPL5
  407                                   .EQUIV  MAPH05,MAPH5
  408                                   .EQUIV  MAPL06,MAPL6
  409                                   .EQUIV  MAPH06,MAPH6
  410                                   .EQUIV  MAPL07,MAPL7
  411                                   .EQUIV  MAPH07,MAPH7
  412
  413
  414
  415
  416            100000                         BYP=BIT15
  417            010000                         VCIP=BIT12
  418            000040                         S1=BIT5
  419            000020                         S0=BIT4
  420            000054                         S1M0M1=BIT5+BIT3+BIT2
  421            000034                         S0M0M1=BIT4+BIT3+BIT2
  422            177744                         MSER=177744
  423
  424                                  .SBTTL   TRAP CATCHER
  425
  426            000000                         .=0
  427                                  ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ''.+2,HALT''
  428                                  ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
  429                                  ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
  430
  431                                  .SBTTL   STARTING ADDRESS(ES)
  432            000200                         .=200
  433
  434  000200   000137  010000                  JMP     @#START         ;;JUMP TO STARTING ADDRESS OF PROGRAM
  435                                  ;;*****************************************************************
  436
  437                                  .SBTTL           ACT11 HOOKS
  438
  439                                  ;*THE FOLLOWING LOCATIONS ARE SETUP TO BE USED WITH ACT11
  440                                  ;*
  441                                  ;*LOCATION 46 WILL CONTAIN THE ADDRESS OF THE LOCICAL
  442                                  ;*END OF THE PROGRAM.
  443                                  ;*LOCATION 52 IS USED TO SPECIFY PROGRAM OPERATING REQUIREMENTS
  444                                  ;*AND/OR RESTRICTIONS. THIS IS ACCOMPLISHED BY SETTING VARIOUS BITS
  445                                  ;*TO A ONE OR A ZERO. THE BITS USED AND THERE MEANING ARE:
  446                                  ;*
  447                                  ;*      BIT 15=1 PROGRAM SHOULD BE POWER FAILED WHILE RUNNING
  448                                  ;*             =0 NO POWER FAIL DESIRED
```

```
                                ;*
                                ;*      BIT 14=1 PROGRAM RUN TIME IS MEMORY SIZE DEPENDENT
                                ;*            =0 RUN TIME IS NOT MEMORY SIZE DEPENDENT
                                ;*
                                ;*      BITS 13-0  MUST BE ZERO'S

            000204                      $SVPC=.                 ;;SAVE LOCATION COUNTER
            000046                      .=46                    ;;SET LOCATION COUNTER
000046      024566                      .WORD   $ENDAD          ;;SET LOC.46 TO ADDRESS $ENDAD
            000052                      .=52                    ;;SET LOCATION COUNTER
000052      000000                      .WORD   0               ;;SET LOC.52 TO ZERO
            000204                      .=$SVPC                 ;; RESTORE LOCATION COUNTER
```

```
                                ;;*****************************************************************

                                .SBTTL  COMMON TAGS

                                ;*THIS TABLE CONTAINS VARIOUS COMMON STORAGE LOCATIONS
                                ;*USED IN THE PROGRAM.

                        001100          .=1100

001100                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000          $PASS:  .WORD   0               ;;CONTAINS PASS COUNT
001102  000             $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103  000             $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114  000             $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115  001             $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS  OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS  OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000  000000  000000          .WORD   0,0,0   ;;RESERVED--NOT TO BE USED
001136  177560          $TKS:   177560                  ;;TTY KBD STATUS
001140  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001142  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG.
001144  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG.
001146  000             $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001147  002             $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001150  012             $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A 'LINE FEED''
001151  000             $TPFLG: .BYTE   0               ;;'TERMINAL AVAILABLE'' FLAG (BIT<07>=0=YES)
001152  000000          $REGAD: .WORD   0               ;;CONTAINS THE  FROM
                                                        ;;WHICH  ($REG0) WAS OBTAINED
001154  000000          $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001156  000000          $REG1:  .WORD   0               ;;CONTAINS (($REGAD)+2)
001160  000000          $REG2:  .WORD   0               ;;CONTAINS (($REGAD)+4)
001162  000000          $REG3:  .WORD   0               ;;CONTAINS (($REGAD)+6)
001164  000000          $REG4:  .WORD   0               ;;CONTAINS (($REGAD)+10)
001166  000000          $REG5:  .WORD   0               ;;CONTAINS (($REGAD)+12)
001170  000000          $TMP0:  .WORD   0               ;;USER DEFINED
001172  000000          $TMP1:  .WORD   0               ;;USER DEFINED
001174  000000          $TMP2:  .WORD   0               ;;USER DEFINED
001176  000000          $TMP3:  .WORD   0               ;;USER DEFINED
001200  000000          $TMP4:  .WORD   0               ;;USER DEFINED
001202  000000          $TMP5:  .WORD   0               ;;USER DEFINED
001204  000000          $TIMES: 0                       ;;MAX. NUMBER OF ITERATIONS
001206  000000          $ESCAPE:0                       ;;ESCAPE ON ERROR
001210  177607  000377    $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001214  077             $QUES:  .ASCII  /?/             ;;QUESTION MARK
001215  015             $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001216  000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
001220  000000          PADRSL: .WORD   0               ;HOLDS THE LOWER 16 BITS OF A 22 BIT
                                                        ;ADDRESS GENERATED FOR TYPE OUT.
001222  000000          PADRSH: .WORD   0               ;HOLDS THE UPPER 6 BITS OF A 22 BIT
```

```
                                                ;ADDRESS GENERATED FOR TYPE OUT
001224  000000          ADRAND: .WORD   0       ;LOGICAL AND OF FAILING ADDRESSES
001226  000000          ADDROR: .WORD   0       ;LOGICAL OR OF FAILING ADDRESSES
001230  000000          DATAND: .WORD   0       ;LOGICAL AND OF BAD DATA
001232  000000          DATAOR: .WORD   0       ;LOGICAL OR OF BAD DATA
001234  000000          PATAND: .WORD   0       ;LOGICAL AND OF PATTERN LOADED
001236  000000          PATTOR: .WORD   0       ;LOGICAL OR OF PATTERN LOADED
001240  000000          LOWEST: .WORD   0       ;HOLDS NUMBER TO PUT IN PAR TO CAUSE THE
                                                ;LOWEST USEABLE MAP REGISTER TO RESPOND
001242  000000          HIGEST: .WORD   0       ;HOLDS NUMBER TO PUT IN PAR TO CAUSE THE
                                                ;HIGHEST USEABLE MAP REGISTER TO RESPOND
001244  000000          LREGL:  .WORD   0       ;HOLDS I/O PAGE ADDR OF LOW 16 BITS OF
                                                ;THE LOWEST USEABLE MAP REGISTER
001246  000000          LREGU:  .WORD   0       ;HOLDS I/O PAGE ADDR OF HIGH 16 BITS OF
                                                ;OF THE LOWEST USEABLE MAP REGISTER
001250  000000          HREGL:  .WORD   0       ;HOLDS I/O PAGE ADDR OF LOW 16 BITS OF
                                                ;THE HIGHEST USEABLE MAP REGISTER
001252  000000          HREGU:  .WORD   0       ;HOLDS I/O PAGE ADDR OF HIGH 16 BITS OF
                                                ;THE HIGHEST USEABLE MAP REGISTER
001254  000000          ERRCNT: .WORD   0       ;MULTIPLE ERROR ERROR COUNTER
001256  000000          CNTR:   .WORD   0       ;AUXILIARY COUNTER
001260  000000          FLAG:   .WORD   0       ;FLAG TO INDICATE TO LAST PROGRAM PASS N
001262  000000          TESTNO: .WORD   0       ;HOLDS TEST NUMBER FOR ERROR TYPE OUTS
001264  000000          CPUEXP: .WORD   0       ;HOLDS THE EXPECTED CPU ERROR CODE
001266  000000          PCPUER: .WORD   0       ;HOLDS RECEIVED CPU ERROR CONDITION
001270  000000          PLOADR: .WORD   0       ;HOLDS LOWER 16 BITS OF CACHE ADDR
001272  000000          PHIADR: .WORD   0       ;HOLDS UPPER 6 BITS OF CACHE ADDR
001274  000000          PPARER: .WORD   0       ;HOLDS RECEIVED PARITY ERROR CONDITION
001276  000000          PCONTR: .WORD   0       ;HOLDS CONTENTS OF CONTROL REGISTER
001300  000000          PMAINT: .WORD   0       ;HOLDS CONTENTS OF MAINTENENCE REGISTER
001302  000000          BADPC:  .WORD   0       ;HOLDS PC OF INST THAT CAUSED TRAP
001304  000000          OLDPC:  .WORD   0       ;HOLDS THE RETURN ADDRESS AFTER A TRAP
001306  000000          OLDPS:  .WORD   0       ;HOLDS THE OLD PROCESSOR STATUS
001310  000000          OLDPSW: .WORD   0       ;HOLDS OLD PSW FOR TBITRESTORE
001312  000000          PMMR0:  .WORD   0       ;HOLDS CONTENTS OF MMR0 AFTER TRAP
001314  000000          PMMR1:  .WORD   0       ;HOLDS CONTENTS OF MMR1 AFTER TRAP
001316  000000          PMMR2:  .WORD   0       ;HOLDS CONTENTS OF MMR2 AFTER TRAP
001320  000000          RSIZE:  .WORD   0       ;WILL HOLD P.A.R. DATA FOR TOP OF MEMORY
001322  000000          RETRY:  .WORD   0       ;RETRY FLAG IN CASE OF PARITY ABORTS
001324  000000          NXTTST: .WORD   0       ;LOCATION TO HOLD ESCAPE ADDRESS ON
                                                ;PARITY ERRORS.
001326  000200          DATA:   .WORD   200     ;PATTERN TO BE USED TO LOAD INTO MEMORY
001330     000          KB11E:  .BYTE   0       ;1174 WITHOUT MP CACHE FLAG
001331     000          KB11EM: .BYTE   0       ;1174 WITH MP CACHE FLAG
001332     000          KB11CM: .BYTE   0       ;KB11CM FLAG (1170 WITH MP MODS)
001333     000          CISP:   .BYTE   0       ;CISP OPTION PRESENT FLAG

                        ;OPCODE FOR MFPT INSTRUCTION (AVAILABLE ON KB11-E AND KB11-EM ONLY)
000007                          MFPT=7
```

```
                        ;;*****************************************************************

                        .SBTTL  ERROR POINTER TABLE

                        ;*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

001334                  $ERRTB:
                        ;ITEM1
001334  024773          EM1                     ;NOT THE CORRECT CPU TRAP CONDITION THRU ERRVEC (#004)
001336  033615          DH1                     ;RECEIVD EXPECTD TESTNO  PC AT ABORT
001340  036752          DT1                     ;PCPUER,CPUEXP,TESTNO,BADPC,0
001342  037574          DF1                     ; 0, 0, 0, 0

                        ;ITEM 2
001344  025055          EM2                     ;UNEXPECTED CPU TRAP THRU ERRVEC (#004)
001346  033661          DH2                     ;RECEIVD TESTNO  PC AT ABORT
001350  036764          DT2                     ;PCPUER,TESTNO,BADPC
001352  037600          DF2                     ; 0, 0, 0

                        ;ITEM 3
001354  025124          EM3                     ;UNEXPECTED CACHE PARITY ERROR THRU CACHVEC (#114)
                                                ;WILL RETRY TEST ONCE
001356  033715          DH3                     ;PARITY  ADDRESS   MAINTEN CONTROL
                                                ;CONDITN REFERENCD REGISTR REGISTR TESTNO PC AT ABORT
001360  036774          DT3                     ;PPARER,LOADDR,PMAINT,PCONTR,TESTNO,BADPC,0
001362  037603          DF3                     ; 0, 2, 0, 0, 0, 0

                        ;ITEM 4
001364  025225          EM4                     ;UNEXPECTED MAIN MEMORY PARITY ERROR THRU CACHVEC (#114)
                                                ;WILL RETRY TEST ONCE
001366  033715          DH3                     ;PARITY  ADDRESS   MAINTEN CONTROL
                                                ;CONDITN REFERENCD REGISTR REGISTR TESTNO PC AT ABORT
001370  036774          DT3                     ;PPARER,LOADDR,PMAINT,PCONTR,TESTNO,BADPC,0
001372  037603          DF3                     ; 0, 2, 0, 0, 0, 0

                        ;ITEM 5
001374  025334          EM5                     ;MEMORY MANAGEMENT TRAP, MEMORY MANAGEMENT STATUS REGISTERS
001376  034045          DH5                     ;STATUS  AUTOI/D VIRTADR
                                                ;REGISTR REGISTR REGISTR TESTNO  PC AT ABORT
001400  037024          DT5                     ;PMMR0,PMMR1,PMMR2,TESTNO,BADPC,0
001402  037611          DF5                     ; 0, 0, 0, 0, 0

                        ;ITEM 6
001404  025442          EM6                     ;SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ
001406  034151          DH6                     ;REGADRS REGADRS
                                                ; ''OR''    ''AND''  #ERRORS TESTNO  ERRORPC
```

```
622  001410  037040          DT6             ;ADDROR,ADRAND,ERRCNT,TESTNO,$ERRPC,0
623  001412  037616          DF6             ; 0, 0, 1, 0, 0
624
625                          ;ITEM 7
626  001414  025522          EM7             ;SUMMARY OF CACHE REGISTERS THAT TIMED OUT ON READ
627  001416  034151          DH6             ;REGADRS REGADRS
628                                          ; ''OR''    ''AND''  #ERRORS TESTNO  ERRORPC
629  001420  037040          DT6             ;ADDROR,ADRAND,ERRCNT,TESTNO,$ERRPC,0
630  001422  037616          DF6             ; 0, 0, 1, 0, 0
631
632                          ;ITEM 10
633  001424  025604          EM10            ;SUMMARY OF MAP REGISTERS NOT HOLDING ZERO IN LOW 16 BITS
634  001426  034241          DH10            ;REGADRS REGADRS RECEIVD RECEIVD
635                                          ; ''OR''    ''AND''  ''OR''    ''AND''  #ERRORS TESTNO  ERRORPC
636  001430  037054          DT10            ;ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO,$ERRPC,0
637  001432  037623          DF10            ; 0, 0, 0, 0, 1, 0, 0
638
639                          ;ITEM 11
640  001434  025675          EM11            ;SUMMARY OF MAP REGISTERS NOT HOLDING ZERO IN UPPER 6 BITS
641  001436  034241          DH10            ;REGADRS REGADRS RECEIVD RECEIVD
642                                          ; ''OR''    ''AND''  ''OR''    ''AND''  #ERRORS TESTNO  ERRORPC
643  001440  037054          DT10            ;ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO,$ERRPC,0
644  001442  037623          DF10            ; 0, 0, 0, 0, 1, 0, 0
645
646                          ;ITEM 12
647  001444  025767          EM12            ;POSSIBLE ERROR IN MAP REGISTER DATA PATH (MAP REG 00)
648  001446  034371          DH12            ;COUNT    COUNT
649                                          ;EXPECTD RECEIVD TESTNO  ERRORPC
650  001450  037074          DT12            ;$REG2,$REG0,TESTNO,$ERRPC,0
651  001452  037632          DF12            ; 0, 0, 0, 0
652
653                          ;ITEM 13
654  001454  026055          EM13            ;NOW PROBABLE ERROR IN MAP REGISTER DATA PATH (MAP REG 20)
655  001456  034371          DH12            ;COUNT    COUNT
656                                          ;EXPECTD RECEIVD TESTNO  ERRORPC
657  001460  037106          DT13            ;$REG3,$REG1,TESTNO,$ERRPC,0
658  001462  037632          DF12            ; 0, 0, 0, 0
659
660                          ;ITEM 14
661  001464  026147          EM14            ;SUMMARY OF DUAL ADDRESSING ERRORS ON LOADING MAP REGISTERS
662  001466  034447          DH14            ;REGLOAD REGLOAD REGDUAL REGDUAL
663                                          ; ''OR''    ''AND''  ''OR''    ''AND''  #ERRORS TESTNO
664  001470  037120          DT14            ;ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO,0
665  001472  037636          DF14            ; 0, 0, 0, 0, 1, 0
666
667                          ;ITEM 15
668  001474  026242          EM15            ;SUMMARY OF COUNT PATTERN FAILURES IN LOWER 16 BITS OF MAP REGIS
669  001476  034566          DH15            ;MAPREG  MAPREG  EXPECTD EXPECTD RECEIVD RECEIVD
670                                          ; ''OR''    ''AND''  ''OR''    ''AND''  ''OR''    ''AND''  #ERRORS TESTNO
671  001500  037136          DT15            ;ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,ERRCNT,TESTNO,0
672  001502  037644          DF15            ; 0, 0, 0, 0, 0, 0, 1, 0
673
674                          ;ITEM 16
675  001504  026346          EM16            ;SUMMARY OF COUNT PATTERN FAILURES IN UPPER 6 BITS OF MAP REGIST
676  001506  034566          DH15            ;MAPREG  MAPREG  EXPECTD EXPECTD RECEIVD RECEIVD
677                                          ; ''OR''    ''AND''  ''OR''    ''AND''  ''OR''    ''AND''  #ERRORS TESTNO
```

```
                                ;ITEM 17
001514  026451                EM17            ;COULD NOT CLEAR CACHE CONTROL REGISTER
                                                ;POSSIBLE ERROR IN CACHE REGISTER DATA PATH
001516  034745                DH17            ;RECEIVD TESTNO  ERRORPC
001520  037160                DT17            ;$REG0,TESTNO,$ERRPC,0
001522  037654                DF17            ; 0, 0, 0

                                ;ITEM 20
001524  026573                EM20            ;COULD NOT CLEAR CACHE MAINTENENCE REGISTER
                                                ;POSSIBLE ERROR IN CACHE REGISTER DATA PATH
001526  034745                DH17            ;RECEIVD TESTNO  ERRORPC
001530  037170                DT20            ;$REG1,TESTNO,$ERRPC,0
001532  037654                DF17            ; 0, 0, 0

                                ;ITEM 21
001534  026721                EM21            ;COULD NOT READ 177740 FROM CACHE LO ADDRESS REG (LOADRS)
                                                ;POSSIBLE ERROR IN CACHE REGISTER DATA PATH
001536  034745                DH17            ;RECEIVD TESTNO  ERRORPC
001540  037160                DT17            ;$REG0,TESTNO,$ERRPC,0
001542  037654                DF17            ; 0, 0, 0

                                ;ITEM 22
001544  027065                EM22            ;COULD NOT READ 000003 FROM CACHE HI ADDRESS REG (HIADRS)
                                                ;POSSIBLE ERROR IN CACHE REGISTER DATA PATH
001546  034745                DH17            ;RECEIVD TESTNO  ERRORPC
001550  037160                DT17            ;$REG0,TESTNO,$ERRPC,0
001552  037654                DF17            ; 0, 0, 0

                                ;ITEM 23
001554  027231                EM23            ;SUMMARY OF COUNT PATTERN FAILURES IN CACHE CONTROL REGISTER
001556  034775                DH23            ;EXPECTD EXPECTD RECEIVD RECEIVD
                                                ; 'OR'    'AND'   'OR'    'AND'   #ERRORS TESTNO
001560  037200                DT23            ;PATTOR,PATAND,DATAOR,DATAND,ERRCNT,TESTNO,0
001562  037657                DF23            ; 0, 0, 0, 0, 1, 0

                                ;ITEM 24
001564  027325                EM24            ;SUMMARY OF COUNT PATTERN FAILURES IN CACHE MAINTENENCE REGISTER
001566  034775                DH23            ;EXPECTD EXPECTD RECEVID RECEIVD
                                                ; 'OR'    'AND'   'OR'    'AND'   #ERRORS TESTNO
001570  037200                DT23            ;PATTOR,PATAND,DATAOR,DATAND,ERRCNT,TESTNO,0
001572  037657                DF23            ; 0, 0, 0, 0, 1, 0

                                ;ITEM 25
001574  027425                EM25            ;REFERENCED MAP REGISTER 0 WITH ADDRESS ONE BIT
                                                ;DIFFERENT THAN 770200
001576  035114                DH25            ;ADDRUSED  BITDIFF TESTNO  ERRORPC
001600  037216                DT25            ;$REG4,$REG0,TESTNO,$ERRPC,0
001602  037665                DF25            ;3, 4, 0, 0

                                ;ITEM 26
001604  027532                EM26            ;REFERENCED CACHE LOW ADDRESS REGISTER WITH
                                                ;ADDRESS ONE BIT DIFFERENT THAN 777740
001606  035114                DH25            ;ADDRUSED  BITDIFF TESTNO  ERRORPC
```

```
   734  001610  037216                DT25            ;$REG4,$REG0,TESTNO,$ERRPC,0
   735  001612  037665                DF25            ;3, 4, 0, 0
   736
   737                                ;ITEM 27
   738  001614  027532                EM26            ;REFERENCED CACHE LO ADDRESS REGISTER WITH
   739                                                ;ONE BIT DIFFERENT THAN 777740
   740  001616  035156                DH27            ;ADDRUSED  TESTNO  ERRORPC
   741  001620  037230                DT27            ;$REG1,TESTNO,$ERRPC
   742  001622  037671                DF27            ;3, 0, 0
   743
   744                                ;ITEM 30
   745  001624  027653                EM30            ;CAN'T GET TO MAIN MEMORY FROM UNIBUS WITH THE MAP OFF
   746                                                ;SO I'LL JUMP TO THE SIZE JUMPER TEST FOR VERIFICATION
   747  001626  035210                DH30            ;TESTNO  ERRORPC
   748  001630  037240                DT30            ;TESTNO,$ERRPC,0
   749  001632  037674                DF30            ;0, 0
   750
   751                                ;ITEM 31
   752  001634  030027                EM31            ;SUMMARY OF COUNT PATTERN FAILURES ON THE UNIBUS DATA  PATH
   753  001636  034775                DH23            ;EXPECTD EXPECTD RECEIVD RECEIVD
   754                                                ;  ''OR''    ''AND''   ''OR''    ''AND''  #ERRORS TESTNO
   755  001640  037200                DT23            ;PATTOR,PATAND,DATAOR,DATAND,ERRCTN,TESTNO,0
   756  001642  037657                DF23            ; 0, 0, 0, 0, 1, 0
   757
   758                                ;ITEM 32
   759  001644  030121                EM32            ;UNIBUS MAP IS RELOCATING WHEN NOT ENABLED
   760  001646  035210                DH30            ;TESTNO  ERRORPC
   761  001650  037240                DT30            ;TESTNO,$ERRPC,0
   762  001652  037674                DF30            ; 0, 0
   763
   764                                ;ITEM 33
   765  001654  030173                EM33            ;CANNOT USE ANY OF THE MAP REGISTERS OR PHYSICAL
   766                                                ;ADDRESS BIT14 IS STUCK LOW, MUST RESTART PROGRAM
   767                                                ;IF YOU DON'T LOOP ON THIS PROBLEM.
   768  001656  035210                DH30            ;TESTNO  ERRORPC
   769  001660  037240                DT30            ;TESTNO,$ERRPC,0
   770  001662  037674                DF30            ; 0, 0
   771
   772                                ;ITEM 34
   773  001664  030350                EM34            ;THE NUMBER OF MAP REGISTERS REMOVED BY JUMPER SETTING
   774                                                ;DOES NOT AGREE WITH THE NUMBER FOUND TO BE MISSING.
   775  001666  035230                DH34            ;REMOVED MISSING TESTNO  ERRORPC
   776  001670  037246                DT34            ;ERRCNT,CNTR,TESTNO,$ERRPC,0
   777  001672  037676                DF34            ; 0, 0, 0, 0
   778
   779                                ;ITEM 35
   780  001674  030521                EM35            ;THE SIZE JUMPERS ON THE UNIBUS MAP ARE NOT SET
   781                                                ;IN THEIR DEFAULT POSITION.  THIS WOULD ALLOW UNIBUS
   782                                                ;ADDRESSES 000000 TO 757776 TO REFERNECE MAIN MEMORY
   783                                                ;THEIR CURRENT SETTING ALLOWS ONLY:
   784  001676  035270                DH35            ;LOWEST  HIGHEST TESTNO  ERRORPC
   785  001700  037260                DT35            ;LOWEST,HIGEST,TESTNO,$ERRPC,0
   786  001702  037702                DF35            ; 4, 4, 0, 0
   787
   788                                ;ITEM 36
   789  001704  031006                EM36            ;MAP REGISTER UNDER TEST DID NOT RESPOND IN DUAL MAPPING TEST
```

```
                                ;ITEM 37
001714  031103                EM37            ;SUMMARY OF UNIBUS ADDRESS ERRORS, WITH MAP RELOCATION DISABLED
001716  034775                DH23            ;EXPECTD EXPECTD RECEIVD RECEIVD
                                                ; ''OR''    ''AND''  ''OR''    ''AND''  #ERRORS TESTNO
001720  037302                DT37            ;ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO
001722  037711                DF37            ; 0, 0, 0, 0, 1, 0

                                ;ITEM 40
001724  031206                EM40            ;MAIN MEMORY TIME OUT OVER THE UNIBUS DID NOT OCCUR PROPERLY.
001726  035422                DH40            ;CONDITN CONDITN
                                                ;EXPECTD RECEIVD TESTNO  ERRORPC
001730  037320                DT40            ;CPUEXP,PCPUER,TESTNO,$ERRPC,0
001732  037717                DF40            ; 0, 0, 0, 0

                                ;ITEM 41
001734  031301                EM41            ;RELOCATION THROUGH THE MAP WAS NOT CORRECT, FULL ADD.
001736  035502                DH41            ;CORRECT ADDRESS
                                                ;ADDRESS FETCHED TESTNO  ERRORPC
001740  037332                DT41            ;$REG2,$REG1,TESTNO,$ERRPC
001742  037723                DF41            ; 0, 0, 0, 0

                                ;ITEM 42
001744  031363                EM42            ;RELOCATION THRU THE MAP WAS NOT CORRECT, CARRY PROPAGATION
001746  035562                DH42            ;CORRECT   EXPECTD RECEIVD
                                                ;ADDRESS   DATA    FROM UB TESTNO  ERRORPC
001750  037344                DT42            ;$REG1,$REG3,$REG2,TESTNO,$ERRPC
001752  037727                DF42            ; 3, 0, 0, 0, 0

                                ;ITEM 43
001754  031456                EM43            ;THE TOP OF MEMORY IS DIFFERENT THAN THE SIZE JUMPERS
001756  035662                DH43            ;SIZJUMP TOPFOUND TESTNO ERRORPC
001760  037360                DT43            ;SIZELO,RSIZE,TESTNO,$ERRPC,0
001762  037734                DF43            ; 0, 0, 0, 0

                                ;ITEM 44
001764  031543                EM44            ;PARITY REPORTING THRU THE MAP IS NOT CORRECT
001766  035722                DH44            ;CONDITN CONDITN ADDRESS   MAINTEN CONTROL
                                                ;EXPECTD RECEIVD REFERENCD REGISTR REGISTR TESTNO  ERRORPC
001770  037372                DT44            ;$TMP4,PPARER,PLOADR,PMAINT,PCONTR,TESTNO,$ERRPC,0
001772  037740                DF44            ; 0, 0, 2, 0, 0, 0, 0

                                ;ITEM 45
001774  031620                EM45            ;MAIN MEMORY TIME OUT OVER THE UNIBUS DID NOT OCCUR PROPERLY.
                                                ;TEST BEING RUN OVER UNIBUS
001776  035422                DH40            ;CONDITN CONDITN
                                                ;EXPECTD RECEIVD TESTNO  ERRORPC
002000  037320                DT40            ;CPUEXP,PCPUER,TESTNO,$ERRPC,0
002002  037717                DF40            ; 0, 0, 0, 0

                                ;ITEM 46
002004  031753                EM46            ;RELOCATION THROUGH THE MAP WAS NOT CORRECT, FULL ADD.
                                                ;TEST BEING RUN OVER UNIBUS
```

```
                                ;CORRECT ADDRESS
                                ;ADDRESS FETCHED TESTNO  ERRORPC
002010  037332  DT41            ;$REG2,$REG1,TESTNO,$ERRPC
002012  037723  DF41            ; 0, 0, 0, 0

                ;ITEM 47
002014  032075  EM47            ;RELOCATION THRU THE MAP WAS NOT CORRECT, CARRY PROPAGATION
                                ;TEST BEING RUN OVER UNIBUS
002016  035562  DH42            ;CORRECT   EXPECTD RECEIVD
                                ;ADDRESS   DATA    FROM UB TESTNO  ERRORPC
002020  037344  DT42            ;$REG1,$REG3,$REG2,TESTNO,$ERRPC
002022  037727  DF42            ; 3, 0, 0, 0, 0

                ;ITEM 50
002024  032230  EM50            ;THE TOP OF MEMORY IS DIFFERENT THAN THE SIZE JUMPERS
                                ;TEST BEING RUN OVER UNIBUS
002026  035662  DH43            ;SIZJUMP TOPFOUND TESTNO
002030  037360  DT43            ;SIZELO,RSIZE,TESTNO,0
002032  037734  DF43            ; 0, 0, 0


                ;ITEM 51
002034  032355  EM51            ;PARITY REPORTING THRU THE MAP IS NOT CORRECT
                                ;TEST BEING RUN OVER UNIBUS
002036  035722  DH44            ;CONDITN CONDITN ADDRESS   MAINTEN CONTROL
                                ;EXPECTD RECEIVD REFERENCD REGISTR REGISTR TESTNO  ERRORPC
002040  037372  DT44            ;$TMP4,PPARER,PLOADR,PMAINT,PCONTR,TESTNO,$ERRPC,0
002042  037740  DF44            ; 0, 0, 2, 0, 0, 0, 0

                ;ITEM 52
002044  032472  EM52            ;SUMMARY OF DUAL MAPPING ERRORS
002046  034775  DH23            ;EXPECTD EXPECTD RECEIVD RECEIVD
                                ; ''OR''    ''AND''   ''OR''    ''AND''  #ERRORS TESTNO
002050  037302  DT37            ;ADDROR,ADRAND,DATAOR,DATAND,$ERRPC,TESTNO,0
002052  037711  DF37            ; 0, 0, 0, 0, 1, 0

                ;ITEM   53
002054  032531  EM53    ;BYP BIT IN UBMR COULD NOT BE CLEARED
002056  036066  DH53
002060  037412  DT53
002062  037674  DF30

                ;ITEM   54
002064  032576  EM54    ;BYP BIT IN UBMR COULD NOT BE SET
002066  036066  DH53
002070  037412  DT53
002072  037674  DF30

                ;ITEM   55
002074  032637  EM55            ;MK11 CSR COULD NOT BE ACCESSED
002076  036115  DH55
002100  037422  DT55
002102  037574  DF1
```

```
                                ;ITEM   56

002104  032713                  EM56                    ;TEST DATA REF NOT A HIT
002106  036160                  DH56
002110  037434                  DT56
002112  037632                  DF12

                                ;ITEM   57

002114  032751                  EM57                    ;TEST DATA REF NOT A MISS
002116  036225                  DH57                    ;CACHE BYPASS ON UNIBUS MAP DID NOT INVALIDATE CACHED DATA
002120  037446                  DT57
002122  037574                  DF1

002124                          ER200:                  ;THIS IS THE STARTING POINT FOR ERROR MESSAGES
                                                        ;201 THRU 377.  THEY ARE USED FOR MULTIPLE
                                                        ;ERROR MESSAGES.

                                ;ITEM 201
002124  033110                  EM201                   ;THE FOLLOWING REGISTERS TIMED OUT WHEN READ
002126  036271                  DH201                   ;REGADRS TESTNO ERRORPC
002130  037460                  DT201                   ;$REG0,TESTNO,$ERRPC,0
002132  037747                  DF201                   ; 0, 0, 0

                                ;ITEM 202
002134  033164                  EM202                   ;THE FOLLOWING MAP REGISTERS WILL NOT CLEAR
002136  036321                  DH202                   ;REGADRS DATAREC TESTNO  ERRORPC.
002140  037470                  DT202                   ;$REG0,$TMP0,TESTNO,$ERRPC,0
002142  037752                  DF202                   ; 0, 0, 0, 0

                                ;ITEM 203
002144  033237                  EM203                   ;THE FOLLOWING ARE DUAL ADDRESSING ERRORS IN THE UNIBUS MAP
002146  036361                  DH203                   ;MAPREG  MAPREG
                                                        ;TESTING DUALED  TESTNO  ERRORPC
002150  037502                  DT203                   ;$REG0,$REG1,$TESTNO,$ERRPC,0
002152  037756                  DF203                   ; 0, 0, 0, 0

                                ;ITEM 204
002154  033332                  EM204                   ;THE COUNT PATTERN THRU THE MAP REGISTERS FAILED
002156  036440                  DH204                   ;REGADRS PATTERN EXPECTD RECEIVD TESTNO  ERRORPC
002160  037514                  DT204                   ;$REG0,$REG2,$REG4,$REG3,TESTNO,$ERRPC,0
002162  037762                  DF204                   ; 0, 0, 0, 0, 0, 0

                                ;ITEM 205
002164  033412                  EM205                   ;UNIBUS DATA PATH COUNT PATTERN FAILURE
002166  036520                  DH205                   ;EXPECTD RECEIVD ADDRSLOAD TESTNO  ERRORPC
002170  037532                  DT205                   ;$REG1,$REG0,$REG2,TESTNO,$ERRPC,0
002172  037770                  DF205                   ;0, 0, 3, 0, 0

                                ;ITEM 206
002174  033461                  EM206                   ;UNIBUS ADDRESSING ERRORS, MAP RELOCATION DISABLED
002176  036572                  DH206                   ;ADDRESS ADDRESS
                                                        ;EXPECTD RECEIVD TESTNO ERRORPC
002200  037546                  DT206                   ;$REG0,$REG3,TESTNO,$ERRPC,0
002202  037775                  DF206                   ; 0, 0, 0, 0
```

```
                                ;ITEM 207
002204  033543                  EM207                   ;COUNT PATTERN FAILURES IN CACHE REGISTERS
002206  036652                  DH207                   ;REGISTR EXPECTD RECEIVD
                                                        ;ADDRESS  DATA    DATA   TESTNO  ERRORPC
002210  037560                  DT207                   ;$REG0,$REG2,$REG3,TESTNO,$ERRPC,0
002212  040001                  DF207                   ; 0, 0, 0, 0, 0
```

```
                        ;;**************************************************************

                        .SBTTL  SCOPE HANDLER ROUTINE

                        ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                        ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                        ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                        ;*SW14=1         LOOP ON TEST
                        ;*SW11=1         INHIBIT ITERATIONS
                        ;*SW09=1         LOOP ON ERROR
                        ;*SW08=1         LOOP ON TEST IN SWR<6:0>
                        ;*CALL
                        ;*      SCOPE           ;;SCOPE=IOT

002214                  $SCOPE:
002214  005037  001322          CLR     RETRY           ;CLEAR RETRY FLAG AN THE START OF
                                                        ;EACH TEST
002220  005037  001254          CLR     ERRCNT          ;CLEAR THE MULTIPLE ERROR COUNTER
002224  005037  001232          CLR     DATAOR          ;LOCATION FOR LOGICAL OR OF BAD DATA
002230  005037  001226          CLR     ADDROR          ;LOCATION FOR LOGICAL OR OF ADDRESS
002234  005037  001236          CLR     PATTOR          ;LOCATION FOR LOGICAL OR OF PATTERN LOADED
002240  012700  177777          MOV     #-1,R0          ;LOAD -1 INTO R0 TO INITIALIZE LOGICAL AND LOCS
002244  010037  001230          MOV     R0,DATAND       ;LOCATION FOR LOGICAL AND OF BAD DATA
002250  010037  001224          MOV     R0,ADRAND       ;LOCATION FOR LOGICAL AND OF ADDRESS
002254  010037  001234          MOV     R0,PATAND       ;LOCATION FOR LOGICAL AND OF PATTERN LOADED
002260  006137  177570          ROL     @#SWR           ;;LOOP ON PRESENT TEST?
002264  100514                  BMI     $OVER           ;;YES IF SW14=1
                        ;#####START OF CODE FOR THE XOR TESTER#####
002266  000416          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                        ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
002270  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
002274  012737  002314  000004  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
002302  005737  177060          TST     @#177060        ;;TIME OUT ON XOR?
002306  012637  000004          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
002312  000466                  BR      $SVLAD          ;;GO TO THE NEXT TEST
002314  022626          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
002316  012637  000004          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
002322  000426                  BR      7$              ;;LOOP ON THE PRESENT TEST
002324                  6$:;#####END OF CODE FOR THE XOR TESTER#####
002324  032737  000400  177570  BIT     #BIT08,@#SWR    ;;LOOP ON SPEC. TEST?
002332  001407                  BEQ     2$              ;;BR IF NO
002334  013746  177570          MOV     @#SWR,-(SP)     ;;SET DESIRED TEST NUM. FROM SWR
002340  042716  000200          BIC     #$SWRMK,(SP)    ;;STRIP AWAY UNDESIRED BITS
002344  122637  001102          CMPB    (SP)+,$TSTNM    ;;ON THE RIGHT TEST?
002350  001462                  BEQ     $OVER           ;;BR IF YES
002352  105737  001103  2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
```

```
1014  002356  001421                          BEQ     3$                      ;;BR IF NO
1015  002360  123737  001115  001103          CMPB    $ERMAX,$ERFLG           ;;MAX. ERRORS FOR THIS TEST OCCURRED?
1016  002366  101015                          BHI     3$                      ;;BR IF NO
1017  002370  032737  001000  177570          BIT     #BIT09,@#SWR            ;;LOOP ON ERROR?
1018  002376  001404                          BEQ     4$                      ;;BR IF NO
1019  002400  013737  001110  001106  7$:     MOV     $LPERR,$LPADR           ;;SET LOOP ADDRESS TO LAST SCOPE
1020  002406  000443                          BR      $OVER
1021  002410  105037  001103          4$:     CLRB    $ERFLG                  ;;ZERO THE ERROR FLAG
1022  002414  005037  001204                  CLR     $TIMES                  ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
1023  002420  000415                          BR      1$                      ;;ESCAPE TO THE NEXT TEST
1024  002422  032737  004000  177570  3$:     BIT     #BIT11,@#SWR            ;;INHIBIT ITERATIONS?
1025  002430  001011                          BNE     1$                      ;;BR IF YES
1026  002432  005737  001100                  TST     $PASS                   ;;IF FIRST PASS OF PROGRAM
1027  002436  001406                          BEQ     1$                      ;;      INHIBIT ITERATIONS
1028  002440  005237  001104                  INC     $ICNT                   ;;INCREMENT ITERATION COUNT
1029  002444  023737  001204  001104          CMP     $TIMES,$ICNT            ;;CHECK THE NUMBER OF ITERATIONS MADE
1030  002452  002021                          BGE     $OVER                   ;;BR IF MORE ITERATION REQUIRED
1031  002454  012737  000001  001104  1$:     MOV     #1,$ICNT                ;;REINITIALIZE THE ITERATION COUNTER
1032  002462  013737  002532  001204          MOV     $MXCNT,$TIMES           ;;SET NUMBER OF ITERATIONS TO DO
1033  002470  105237  001102          $SVLAD: INCB    $TSTNM                  ;;COUNT TEST NUMBERS
1034  002474  011637  001106                  MOV     (SP),$LPADR             ;;SAVE SCOPE LOOP ADDRESS
1035  002500  011637  001110                  MOV     (SP),$LPERR             ;;SAVE ERROR LOOP ADDRESS
1036  002504  005037  001206                  CLR     $ESCAPE                 ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
1037  002510  112737  000001  001115          MOVB    #1,$ERMAX               ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
1038  002516  013737  001102  177570  $OVER:  MOV     $TSTNM,@#DISPLAY        ;;DISPLAY TEST NUMBER
1039  002524  013716  001106                  MOV     $LPADR,(SP)             ;;FUDGE RETURN ADDRESS
1040  002530  000002                          RTI                             ;;FIXES PS
1041  002532  000144                  $MXCNT: 100.                            ;;MAX. NUMBER OF ITERATIONS
1042                                  ;;**************************************************************************
1043
1044                                  .SBTTL  ERROR HANDLER ROUTINE
1045
1046                                  ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
1047                                  ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
1048                                  ;*AND GO TO ERTYPE ON ERROR
1049                                  ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
1050                                  ;*SW15=1         HALT ON ERROR
1051                                  ;*               HALT CAN OCCUR BEFORE AND AFTER THE ERROR TYPEOUT
1052                                  ;*SW13=1         INHIBIT ERROR TYPEOUTS
1053                                  ;*SW10=1         BELL ON ERROR
1054                                  ;*SW09=1         LOOP ON ERROR
1055                                  ;*CALL
1056                                  ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
1057
1058  002534                          $ERROR:
1059  002534  113737  001102  001262          MOVB    $TSTNM,TESTNO   ;SAVE TEST NUMBER FOR ERROR TYPE OUT
1060  002542  005237  001254                  INC     ERRCNT          ;COUNT ALL MULTIPLE ERRORS
1061  002546  010037  001154                  MOV     R0,$REG0        ;SAVE R0 FOR POSSIBLE TYPE OUT
1062  002552  010137  001156                  MOV     R1,$REG1        ;SAVE R1 FOR POSSIBLE TYPE OUT
1063  002556  010237  001160                  MOV     R2,$REG2        ;SAVE R2 FOR POSSIBLE TYPE OUT
1064  002562  010337  001162                  MOV     R3,$REG3        ;SAVE R3 FOR POSSIBLE TYPE OUT
1065  002566  010437  001164                  MOV     R4,$REG4        ;SAVE R4 FOR POSSIBLE TYPE OUT
1066  002572  010537  001166                  MOV     R5,$REG5        ;SAVE R5 FOR POSSIBLE TYPE OUT
1067  002576  105237  001103          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
1068  002602  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
1069  002604  013737  001102  177570          MOV     $TSTNM,@#DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
```

```
1070  002612  005737  177570            TST     @#SWR           ;;HALT ON ERROR = 1?
1071  002616  100001                    BPL     8$              ;;BRANCH IF NO
1072  002620  000000                    HALT                    ;;YES--HALT
1073  002622  032737  002000  177570 8$: BIT     #BIT10,@#SWR    ;;BELL ON ERROR?
1074  002630  001402                    BEQ     1$              ;;NO - SKIP
1075  002632  104400  001210            TYPE    ,$BELL          ;;RING BELL
1076  002636  005237  001112         1$: INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
1077  002642  011637  001116            MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
1078  002646  162737  000002  001116    SUB     #2,$ERRPC
1079  002654  117737  176236  001114    MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
1080  002662  032737  020000  177570    BIT     #BIT13,@#SWR    ;;SKIP TYPEOUT IF SET
1081  002670  001004                    BNE     2$              ;;SKIP TYPEOUTS
1082  002672  004737  003036            JSR     PC,ERTYPE       ;;GO TO USER ERROR ROUTINE
1083  002676  104400  001215            TYPE    ,$CRLF
1084  002702  005737  177570         2$: TST     @#SWR           ;;HALT ON ERROR
1085  002706  100001                    BPL     9$              ;;SKIP IF CONTINUE
1086  002710  000000                    HALT                    ;;HALT ON ERROR!
1087  002712  022737  024566  000042 9$: CMP     #$ENDAD,42      ;;ACT-11?
1088  002720  001001                    BNE     3$              ;;BRANCH IF NO
1089  002722  000000                    HALT                    ;;YES
1090  002724  032737  001000  177570 3$: BIT     #BIT09,@#SWR    ;;LOOP ON ERROR SWITCH SET?
1091  002732  001402                    BEQ     4$              ;;BR IF NO
1092  002734  013716  001110            MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
1093  002740  005737  001206         4$: TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
1094  002744  001402                    BEQ     5$              ;;BR IF NONE
1095  002746  013716  001206            MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
1096  002752                         5$:
1097  002752  032737  001000  177570    BIT     #SW9,SWR        ;ARE YOU LOOPING ON THIS ERROR?
1098  002760  001425                    BEQ     EREXIT          ;BRANCH IF NOT LOOPING ON ERROR
1099  002762  012737  177777  177766    MOV     #-1,@#CPUERR    ;CLEAR CPU ERROR REGISTER
1100  002770  012737  177777  177744    MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
1101  002776  042737  177776  177572    BIC     #177776,@#MMR0  ;CLEAR MEMORY MANAGEMENT STATUS REGISTER
1102  003004  012737  177777  005154    MOV     #-1,TOFLAG      ;INITIALIZE TRAP FLAG
1103  003012  012737  177777  005654    MOV     #-1,CPFLAG      ;INITIALIZE CP TRAP FLAG
1104  003020  012737  177777  005766    MOV     #-1,PAFLAG      ;INITIALIZE PARITY TRAP FLAG
1105  003026  012737  177777  006212    MOV     #-1,MMFLAG      ;INITIALIZE MEMORY MANAGEMENT TRAP FLAG
1106  003034  000002              EREXIT: RTI                     ;RETURN TO TEST
1107
1108
1109                                    .SBTTL  ERROR MESSAGE TYPE OUT ROUTINE
1110
1111
1112                                    ;*      THIS SUBROUTINE IS CALLED BY THE ERROR HANDLER TO TYPE
1113                                    ;*      THE ERROR MESSAGES.  IT PICKS UP THE ITEM BYTE ($ITEMB) NUMBER
1114                                    ;*      AND USES THAT TO INDEX THROUGH THE ERROR TABLE.  THE ERROR
1115                                    ;*      TABLE STARTS AT '$ERRTB'' AND HAS FOUR (4) POINTERS FOR EACH
1116                                    ;*      ENTRY, 'EM', 'DH', 'DT', 'DF'.  THE 'EM' POINTS TO THE ERROR
1117                                    ;*      MESSAGE WHICH IS AN ASCIZ STRING.  THE 'DH' POINTS TO THE DATA
1118                                    ;*      HEADER WHICH IS ANOTHER ASCIZ STRING.  THE 'DT' POINTS TO THE
1119                                    ;*      DATA TABLE WHICH IS A GROUP OF WORDS CONTAINING THE ADDRESSES
1120                                    ;*      OF THE DATA TO BY TYPED.  THE FORMAT OF THIS DATA IS
1121                                    ;*      CONTROLLED BY THE 'DF' WHICH IS THE POINTER TO THE DATA FORMAT.
1122                                    ;*      THE DATA FORMAT IS A GROUP OF BYTES WHICH CONTAIN NUMBERS
1123                                    ;*      THAT CORRESPOND TO DIFFERENT TYPING FORMATS.
1124                                    ;*      0       -16 BIT OCTAL FORMAT
1125                                    ;*      1       -DECIMAL FORMAT
```

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                                ;*      2       -22 BIT OCTAL FORMAT.  DATA IS LOWER 16 BITS OF THE
                                ;*.             PHYSICAL ADDRESS, UPPER 6 BITS ARE ADJACENT TO LOWER 16
                                ;*      3       -22 BIT OCTAL FORMAT.  DATA IS THE 16 BIT VIRTUAL
                                ;*              ADDRESS IN KERNEL I-SPACE.
                                ;*      4       -18 BIT OCTAL FORMAT.  DATA IS A 16 BIT NUMBER THAT
                                ;*              WILL BE CONVERTED INTO A UNIBUS ADDRESS BY LEFT
                                ;*              SHIFTING IT 6 BITS.
003036  010046                  ERTYPE: MOV     R0,-(KSP)       ;SAVE R0 ON STACK
003040  005000                          CLR     R0              ;CLEAR R0
003042  113700  001114                  MOVB    @#$ITEMB,R0     ;PUT ITEM NUMBER IN R0
003046  001004                          BNE     1$              ;BRANCH IF IT IS NON-ZERO
003050  013746  001116                  MOV     $ERRPC,-(KSP)   ;PUT ERROR PC ON STACK FOR TYPING
003054  104402                          TYPOC                   ;TYPE FAILING PC
003056  000526                          BR      13$             ;GO TO RETURN
003060  005300                  1$:     DEC     R0              ;ADJUST ITEM NUMBER TO BE A POINTER
003062  072027  000003                  ASH     #3,R0           ;LEFT SHIFT ITEM NO. 3 PLACES
003066  100024                          BPL     22$             ;BRANCH IF ITEM #LESS THAN 200
003070  032700  001000                  BIT     #BIT9,R0        ;SEE IF ITEM # WAS 3XX
003074  001415                          BEQ     21$             ;BRANCH IF ITEM # WAS 2XX
                                                                ;AND TYPE ERROR MESSAGE
003076  032737  000200  177570          BIT     #SW7,@#SWR      ;SEE IF SWITCH 7 IS UP
003104  001404                          BEQ     20$             ;BRANCH IF SWITCH IS NOT UP
                                                                ;AND TYPE DATA, ON MULTIPLE ERRORS
003106  062766  000004  000002          ADD     #4,2(KSP)       ;SKIP 'TYPE  ,$CRLF' IF SW 7 IS UP
                                                                ;INHIBIT MULTIPLE ERROR TYPEOUTS
003114  000507                          BR      13$             ;BRANCH TO EXIT
003116  042700  177000          20$:    BIC     #177000,R0      ;CLEAR UPPER BYTE OF R0
003122  062700  002130                  ADD     #ER200+4,R0     ;POINT TO DATA TABLE ENTRY
003126  000424                          BR      5$              ;GO TYPE DATA TABLE
003130  042700  177000          21$:    BIC     #177000,R0      ;CLEAR UPPER BYTE OF R0
003134  062700  000570                  ADD     #<ER200-$ERRTB>,R0 ;ADD DIFFERENCE BETWEEN
                                                                ;ITEM 1 AND ITEM 201
                                ;;                      GET POINTER TO ERROR MESSAGE AND TYPE IT
                                ;;                      IF THE POINTER IS NOT ZERO
003140  062700  001334          22$:    ADD     #$ERRTB,R0      ;ADD BASE OF ERROR TABLE
003144  012037  003154                  MOV     (R0)+,2$        ;PUT MESSAGE POINTER IN TYPE STATEMENT
003150  001404                          BEQ     3$              ;BRANCH IF NO ERROR MESSAGE
003152  104400                          TYPE                    ;TYPE ERROR MESSAGE
003154  000000                  2$:     .WORD   0               ;POINTER TO ERROR MESSAGE
003156  104400  001215                  TYPE    ,$CRLF          ;TYPE CRLF
                                ;;                      GET THE POINTER TO THE DATA HEADER AND
                                ;;                      TYPE IT IF THE POINTER IS NOT ZERO
003162  012037  003172          3$:     MOV     (R0)+,4$        ;PUT HEADER POINTER IN TYPE STATEMENT
003166  001404                          BEQ     5$              ;BRANCH IF NO DATA HEADER
003170  104400                          TYPE                    ;TYPE THE DATA HEADER
003172  000000                  4$:     .WORD   0               ;POINTER TO DATA HEADER
003174  104400  001215                  TYPE    ,$CRLF          ;TYPE CRLF
                                ;;                      THIS IS THE START OF THE DATA OUTPUT IF THE
                                ;;                      DATA POINTER IS NOT ZERO.  R0 POINTS TO THE
                                ;;                      DATA FORMAT, R1 POINTS TO THE ADDRESS OF
                                ;;                      THE DATA WORDS.
003200  010146                  5$:     MOV     R1,-(KSP)       ;SAVE R1 ON THE STACK
003202  012001                          MOV     (R0)+,R1        ;PUT DATA TABLE POINTER IN R1
003204  001452                          BEQ     12$             ;BRANCH IF NO DATA TABLE
003206  012000                          MOV     (R0)+,R0        ;PICK UP DATA FORMAT POINTER
003210  105710                  6$:     TSTB    (R0)            ;IS THIS WORD OCTAL
```

```
1182  003212  001003                    BNE     7$              ;BRANCH IF NOT 16-BIT OCTAL
1183                              ;::                   THIS IS 16 BIT OCTAL FORMAT (DF = 0)
1184  003214  013146                    MOV     @(R1)+,-(KSP)   ;PUT WORD ON STACK FOR TYPING
1185  003216  104402                    TYPOC                   ;TYPE THE WORD ON STACK AS 16 BIT OCTAL
1186  003220  000436                    BR      11$             ;GET READY FOR NEXT WORD
1187  003222  122710  000001    7$:     CMPB    #1,(R0)         ;IS THE WORD DECIMAL
1188  003226  001003                    BNE     8$              ;BRANCH IF NOT DECIMAL
1189                              ;::                   THIS IS DECIMAL FORMAT (DF = 1)
1190  003230  013146                    MOV     @(R1)+,-(KSP)   ;PUT WORD ON STACK FOR TYPING
1191  003232  104410                    TYPDS                   ;TYPE THE WORD ON STACK AS DECIMAL
1192  003234  000430                    BR      11$             ;GET READY FOR NEXT WORD
1193  003236  122710  000002    8$:     CMPB    #2,(R0)         ;IS WORD 22-BIT PHYSICAL ADDRESS
1194  003242  001012                    BNE     9$              ;BRANCH IF NOT 22-BIT PHYSICAL ADDR
1195                              ;::                   THIS IS 22-BIT PHYSICAL FORMAT (DF = 2)
1196  003244  012146                    MOV     (R1)+,-(KSP)    ;PUT ADDR OF LOW WORD ON STACK
1197  003246  004737  004750            JSR     PC,$DB2O        ;CONVERT NUMBER TO OCTAL ASCIZ
1198  003252  062716  000003            ADD     #3,(KSP)                ;ONLY WANT 8 DIGITS
1199  003256  012637  003264            MOV     (KSP)+,30$      ;PUT POINTER AFTER 'TYPE' CALL
1200  003262  104400                    TYPE                    ;TYPE ASCIZ STRING
1201  003264  000000    30$:    .WORD   0                       ;WORD HOLDS POINTER TO ASCIZ STRING
1202  003266  000413                    BR      11$             ;GET READY FOR NEXT WORD
1203  003270  122710  000003    9$:     CMPB    #3,(R0)         ;IS THIS A 16-BIT VIRTUAL ADDRESS
1204  003274  001004                    BNE     10$             ;BRANCH IF NOT 16-BIT VIRT. ADDR.
1205                              ;::                   THIS IS 22-BIT VIRTUAL ADDRESS FORMAT
1206                              ;::                   KERNEL I-SPACE ASSUMED.  (DF = 3)
1207  003276  013146                    MOV     @(R1)+,-(KSP)   ;PUT 16-BIT VIRTUAL ADDR ON STACK
1208  003300  004737  003344            JSR     PC,TYPVAD       ;GO TYPE 22-BIT ADDRESS FROM 16-BIT V.A.
1209  003304  000404                    BR      11$             ;GET READY FOR NEXT WORD
1210                              ;::                   THIS IS FORMAT 4.  DATA WORD IS A UNIBUS ADDRESS
1211                              ;::                   OUTPUT WILL BE 18-BITS WORD LEFT SHIFTED 6.
1212  003306  013146    10$:    MOV     @(R1)+,-(KSP)   ;PUSH 16-BIT UNIBUS ADDRESS ON STACK
1213  003310  004737  003452            JSR     PC,UBADDR       ;CONVERT TO 18-BIT UNIBUS ADDR AND TYPE
1214  003314  000400                    BR      11$             ;GET READY FOR NEXT WORD
1215  003316  005200    11$:    INC     R0                      ;POINT TO NEXT FORMAT BYTE
1216  003320  104400  003340            TYPE    ,32$            ;TYPE TWO SPACES
1217  003324  005711                    TST     (R1)            ;IS THERE ANOTHER WORD?
1218  003326  001401                    BEQ     12$             ;BRANCH IF ALL DONE
1219  003330  000727                    BR      6$              ;GO BACK FOR NEXT NUMBER
1220  003332  012601    12$:    MOV     (KSP)+,R1               ;RESTORE R1
1221  003334  012600    13$:    MOV     (KSP)+,R0               ;RESTORE R0
1222  003336  000207                    RTS     PC              ;RETURN TO ERROR ROUTINE
1223  003340  020040      000   32$:    .ASCIZ  ?  ?            ;TWO SPACES
1224          003344                    .EVEN
1225
1226
1227                              .SBTTL  CONVERT 16-BIT VIRTUAL ADDRESS TO 22-BIT PHYSICAL ADDRESS
1228                              ;*
1229                              ;*      THIS ROUTINE IS CALLED BY A 'JSR PC' AFTER THE VIRTUAL ADDRESS
1230                              ;*      IS PUSHED ON THE KERNEL STACK.  THE V.A. IS THEN LOADED INTO
1231                              ;*      R1 AND THE UPPER 3 BITS ARE SHIFTED INTO R0 TO SELECT THE
1232                              ;*      CORRECT KERNEL I-SPACE PAR.  THE LOWER 12 BITS OF THE VIRTUAL
1233                              ;*      ADDRESS ARE ADDED TO THE PAR AS THEY ARE BY MEMORY MANAGEMENT
1234                              ;*      AND THE PHYSICAL ADDRESS IS SAVED IN MEMORY TO BE CONVERTED
1235                              ;*      TO ASCIZ AND TYPED.
1236                              ;*
1237  003344  104412    TYPVAD: SAVREG                          ;SAVE ALL REGISTERS
```

```
1238  003346  016601  000002          MOV     2(KSP),R1       ;PUT VIRTUAL ADDR IN R1
1239  003352  005000                  CLR     R0              ;CLEAR R0 FOR CALCULATIONS
1240  003354  073027  000003          ASHC    #3,R0           ;LEFT SHIFT R0,R1 3 PLACES
1241  003360  006300                  ASL     R0              ;LEFT SHIFT R0 ONE MORE PLACE
1242  003362  006001                  ROR     R1              ;RIGHT SHIFT R1 SO OFFSET IS CORRECT
1243  003364  006001                  ROR     R1              ;RIGHT SHIFT R1
1244  003366  006001                  ROR     R1              ;RIGHT SHIFT R1
1245  003370  062700  172340          ADD     #KIPAR0,R0      ;FORM DESIRED PAR ADDR IN R0
1246  003374  011003                  MOV     (R0),R3         ;PUT CONTENTS OF PAR IN R3
1247  003376  005002                  CLR     R2              ;CLEAR R2 FOR PHYSICAL ADDR CALCULATIONS
1248  003400  073227  000006          ASHC    #6,R2           ;LEFT SHIFT <R2,R3> 6 PLACES
1249  003404  060103                  ADD     R1,R3           ;ADD OFFSET IN R1 TO BASE IN R3
1250  003406  005502                  ADC     R2              ;ADD ANY POSSIBLE CARRY TO UPPER 6 BITS
1251  003410  010237  001222          MOV     R2,PADRSH       ;PUT UPPER 6 BITS OF ADDR IN CORE
1252  003414  010337  001220          MOV     R3,PADRSL       ;PUT LOWER 16 BITS OF ADDR IN CORE
1253  003420  012746  001220          MOV     #PADRSL,-(KSP)  ;PUT POINTER TO LOWER 16 BITS ON STACK
1254  003424  004737  004750          JSR     PC,$DB2O        ;CONVERT NUMBER TO OCTAL ASCIZ
1255  003430  062716  000003          ADD     #3,(KSP)        ;ONLY TYPE 8 DIGITS
1256  003434  012637  003442          MOV     (KSP)+,3$       ;PUT POINTER AFTER TYPE INST
1257  003440  104400                  TYPE                    ;TYPE THE 22-BIT VIRTUAL ADDRESS
1258  003442  000000          3$:     .WORD   0               ;THIS WORD HOLDS THE POINTER TO
1259                                                          ;THE ASCIZ STRING
1260  003444  104414                  RESREG                  ;RESTORE ALL THE REGISTERS
1261  003446  012616                  MOV     (KSP)+,(KSP)    ;LEAVE ONLY RETURN ADDR ON STACK
1262  003450  000207                  RTS     PC              ;RETURN TO ERROR HANDLER
1263
1264
1265                                  ;*THIS SUBROUTINE IS USED TO CONVERT THE A WORD PUSHED
1266                                  ;*ON THE STACK INTO A UNIBUS ADDRESS AND TYPE IT AS A
1267                                  ;*6 DIGIT NUMBER.  IT USES R1 & R0 AND LEAVES
1268                                  ;*ALL OTHER REGISTERS UNCHANGED.
1269  003452  016601  000002  UBADDR: MOV     2(KSP),R1       ;LOAD 16 BIT ADDRESS INTO R1
1270  003456  005000                  CLR     R0              ;CLEAR R0 FOR CALCULATIONS
1271  003460  073027  000006          ASHC    #6,R0           ;LEFT SHIFT <R0:R1> 6 PLACES
1272  003464  010137  001220          MOV     R1,PADRSL       ;PUT LOWER 16 BITS IN PADRSL
1273  003470  010037  001222          MOV     R0,PADRSH       ;PUT UPPER 6 BITS IN PADRSH
1274  003474  012746  001220          MOV     #PADRSL,-(KSP)  ;PUSH POINTER TO WORDS ON STACK
1275  003500  004737  004750          JSR     PC,$DB2O        ;JUMP TO CONVERT ROUTINE
1276  003504  062716  000005          ADD     #5,(KSP)        ;ONLY USE LOWER 6 CHARS.
1277  003510  012637  003516          MOV     (KSP)+,3$       ;PUT POINTER AFTER TYPE CALL.
1278  003514  104400                  TYPE
1279  003516  000000          3$:     .WORD   0               ;HOLDS POINTER TO FIRST CHAR.
1280  003520  012616                  MOV     (KSP)+,(KSP)    ;LEAVE ONLY RETURN ADDRESS ON STACK
1281  003522  000207                  RTS     PC              ;RETURN TO ERROR TYPE ROUTINE.
1282
1283
1284                                  ;;*****************************************************************
1285
1286                                  .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
1287
1288                                  ;*SAVE R0-R5
1289                                  ;*CALL:
1290                                  ;*      SAVREG
1291                                  ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
1292                                  ;*
1293                                  ;*TOP---(+16)
```

```
                                        ;* +2---(+18)
                                        ;* +4---R5
                                        ;* +6---R4
                                        ;* +8---R3
                                        ;*+10---R2
                                        ;*+12---R1
                                        ;*+14---R0

003524                                  $SAVREG:
003524  010046                                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
003526  010146                                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
003530  010246                                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
003532  010346                                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
003534  010446                                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
003536  010546                                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
003540  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
003544  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
003550  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
003554  016646  000022                          MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
003560  000002                                  RTI

                                        ;*RESTORE R0-R5
                                        ;*CALL:
                                        ;*      RESREG
003562                                  $RESREG:
003562  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
003566  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
003572  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
003576  012666  000022                          MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
003602  012605                                  MOV     (SP)+,R5        ;;POP STACK INTO R5
003604  012604                                  MOV     (SP)+,R4        ;;POP STACK INTO R4
003606  012603                                  MOV     (SP)+,R3        ;;POP STACK INTO R3
003610  012602                                  MOV     (SP)+,R2        ;;POP STACK INTO R2
003612  012601                                  MOV     (SP)+,R1        ;;POP STACK INTO R1
003614  012600                                  MOV     (SP)+,R0        ;;POP STACK INTO R0
003616  000002                                  RTI
                                        ;;**************************************************************************

                                        .SBTTL  TYPE ROUTINE

                                        ;*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:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                        ;*
                                        ;*CALL:
                                        ;*1) USING A TRAP INSTRUCTION
                                        ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                        ;*OR
                                        ;*      TYPE
                                        ;*      MESADR
                                        ;*
                                        ;*2) USING A JSR INSTRUCTION
                                        ;*      MOV     PS,-(SP)        ;;PUSH PROCESSOR STATUS WORD ON THE STACK
                                        ;*      JSR     PC,$TYPE        ;;CALL TYPE ROUTINE
```

```
1350                                    ;*      MESADDR                 ;;FIRST ADRESS OF MESSAGE
1351
1352  003620  105737  001151            $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
1353  003624  100002                            BPL     1$              ;;BR IF YES
1354  003626  000000                            HALT                    ;;HALT HERE IF NO TERMINAL
1355  003630  000407                            BR      3$              ;;LEAVE
1356  003632  010046                    1$:     MOV     R0,-(SP)        ;;SAVE R0
1357  003634  017600  000002                    MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
1358  003640  112046                    2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
1359  003642  001005                            BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
1360  003644  005726                            TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
1361  003646  012600                            MOV     (SP)+,R0        ;;RESTORE R0
1362  003650  062716  000002            3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
1363  003654  000002                            RTI                     ;;RETURN
1364  003656  122716  000011            4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
1365  003662  001426                            BEQ     8$
1366  003664  122716  000200                    CMPB    #CRLF,(SP)      ;;BRANCH IF NOT
1367  003670  001004                            BNE     5$
1368  003672  005726                            TST     (SP)+           ;;POP  <CR><LF> EQUIV
1369  003674  104400  001215                    TYPE    ,$CRLF
1370  003700  000757                            BR      2$              ;;GET NEXT CHARACTER
1371  003702  004737  003764            5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
1372  003706  123726  001150            6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
1373  003712  001352                            BNE     2$              ;;IF NO GO GET NEXT CHAR.
1374  003714  013746  001146                    MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
1375                                                                    ;;AND THE NULL CHAR.
1376  003720  105366  000001            7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
1377  003724  002770                            BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
1378  003726  004737  003764                    JSR     PC,$TYPEC       ;;GO TYPE A NULL
1379  003732  105337  004030                    DECB    $CHARCNT        ;;DON'T COUNT THE NULL AS A CHARACTER
1380  003736  000770                            BR      7$              ;;LOOP
1381
1382                                    ;;HORIZONTAL TAB PROCESSOR
1383
1384  003740  112716  000040            8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
1385  003744  004737  003764            9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
1386  003750  132737  000007  004030            BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
1387  003756  001372                            BNE     9$              ;;TAB STOP
1388  003760  005726                            TST     (SP)+           ;;POP SPACE OFF STACK
1389  003762  000726                            BR      2$              ;;GET NEXT CHARACTER
1390  003764  105777  175152            $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
1391  003770  100375                            BPL     $TYPEC
1392  003772  116677  000002  175144            MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
1393  004000  122766  000015  000002            CMPB    #CR,2(SP)       ;;BRANCH IF
1394  004006  001003                            BNE     1$              ;;NOT <CR>
1395  004010  105037  004030                    CLRB    $CHARCNT        ;;
1396  004014  000406                            BR      $TYPEX          ;;EXIT
1397  004016  122766  000012  000002    1$:     CMPB    #LF,2(SP)       ;;BRANCH IF
1398  004024  001402                            BEQ     $TYPEX          ;;<LF>
1399  004026  105227                            INCB    (PC)+           ;;INC SPACE
1400  004030  000000            $CHARCNT:.WORD  0                       ;;COUNT
1401  004032  000207            $TYPEX: RTS     PC
1402
1403                                    ;;**************************************************************
1404
1405                                    .SBTTL  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

004034  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
004040  116637  000001  004257          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
004046  112637  004261                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
004052  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
004056  000406                          BR      $TYPON
004060  112737  000001  004257  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
004066  112737  000006  004261          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
004074  112737  000005  004256  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
004102  010346                          MOV     R3,-(SP)        ;;SAVE R3
004104  010446                          MOV     R4,-(SP)        ;;SAVE R4
004106  010546                          MOV     R5,-(SP)        ;;SAVE R5
004110  113704  004261                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
004114  005404                          NEG     R4
004116  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
004122  110437  004260                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
004126  113704  004257                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
004132  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
004136  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
004140  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
004142  000404                          BR      3$              ;;GO DO MSB
004144  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
004146  006105                          ROL     R5
004150  006105                          ROL     R5
004152  010503                          MOV     R5,R3
004154  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
004156  105337  004260                  DECB    $OMODE          ;;TYPE THIS DIGIT?
004162  100016                          BPL     7$              ;;BR IF NO
004164  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
004170  001002                          BNE     4$              ;;TEST FOR 0
004172  005704                          TST     R4              ;;SUPPRESS THIS 0?
004174  001403                          BEQ     5$              ;;BR IF YES
004176  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
004200  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
```

```
                                5$:     BIS     #'0,R3          ;;MAKE ASCII IF NOT ALREADY
                                        MOVB    R3,8$           ;;SAVE FOR TYPING
                                        TYPE    ,8$             ;;GO TYPE THIS DIGIT
                                7$:     DECB    $OCNT           ;;COUNT BY 1
                                        BGT     2$              ;;BR IF MORE TO DO
                                        BLT     6$              ;;BR IF DONE
                                        INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
                                        BR      2$              ;;GO DO THE LAST DIGIT
                                6$:     MOV     (SP)+,R5        ;;RESTORE R5
                                        MOV     (SP)+,R4        ;;RESTORE R4
                                        MOV     (SP)+,R3        ;;RESTORE R3
                                        MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
                                        MOV     (SP)+,(SP)
                                        RTI                     ;;RETURN
                                8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
                                        .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
                                $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
                                $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
                                $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
                                ;;**************************************************************

                                .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

                                ;*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

                                $TYPDS:
                                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
                                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
                                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
                                        MOV     R3,-(SP)        ;;PUSH R3 ON STACK
                                        MOV     R5,-(SP)        ;;PUSH R5 ON STACK
                                        MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
                                        MOV     20(SP),R5       ;;GET THE INPUT NUMBER
                                        BPL     1$              ;;BR IF INPUT IS POS.
                                        NEG     R5              ;;MAKE THE BINARY NUMBER POS.
                                        MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
                                1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
                                        MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
                                        MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
                                2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
                                        MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
                                3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
                                        BLT     4$              ;;BR IF DONE
                                        INC     R2              ;;INCREASE THE BCD DIGIT BY 1
                                        BR      3$
                                4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
                                        TST     R2              ;;CHECK IF BCD DIGIT=0
                                        BNE     5$              ;;FALL THROUGH IF 0
                                        TSTB    (SP)            ;;STILL DOING LEADING 0'S?
```

```
1518  004356  100407                          BMI     7$                      ;;BR IF YES
1519  004360  106316                  5$:     ASLB    (SP)                    ;;MSD?
1520  004362  103003                          BCC     6$                      ;;BR IF NO
1521  004364  116663  000001  177777          MOVB    1(SP),-1(R3)            ;;YES--SET THE SIGN
1522  004372  052702  000060          6$:     BIS     #'0,R2                  ;;MAKE THE BCD DIGIT ASCII
1523  004376  052702  000040          7$:     BIS     #' ,R2                  ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
1524  004402  110223                          MOVB    R2,(R3)+                ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
1525  004404  005720                          TST     (R0)+                   ;;JUST INCREMENTING
1526  004406  020027  000010                  CMP     R0,#10                  ;;CHECK THE TABLE INDEX
1527  004412  002746                          BLT     2$                      ;;GO DO THE NEXT DIGIT
1528  004414  003002                          BGT     8$                      ;;GO TO EXIT
1529  004416  010502                          MOV     R5,R2                   ;;GET THE LSD
1530  004420  000764                          BR      6$                      ;;GO CHANGE TO ASCII
1531  004422  105726                  8$:     TSTB    (SP)+                   ;;WAS THE LSD THE FIRST NON-ZERO?
1532  004424  100003                          BPL     9$                      ;;BR IF NO
1533  004426  116663  177777  177776          MOVB    -1(SP),-2(R3)           ;;YES--SET THE SIGN FOR TYPING
1534  004434  105013                  9$:     CLRB    (R3)                    ;;SET THE TERMINATOR
1535  004436  012605                          MOV     (SP)+,R5                ;;POP STACK INTO R5
1536  004440  012603                          MOV     (SP)+,R3                ;;POP STACK INTO R3
1537  004442  012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
1538  004444  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
1539  004446  012600                          MOV     (SP)+,R0                ;;POP STACK INTO R0
1540  004450  104400  004476                  TYPE    ,$DBLK                  ;;NOW TYPE THE NUMBER
1541  004454  016666  000002  000004          MOV     2(SP),4(SP)             ;;ADJUST THE STACK
1542  004462  012616                          MOV     (SP)+,(SP)
1543  004464  000002                          RTI                             ;;RETURN TO USER
1544  004466  023420                  $DTBL:  10000.
1545  004470  001750                          1000.
1546  004472  000144                          100.
1547  004474  000012                          10.
1548  004476  000004                  $DBLK:  .BLKW   4
1549                                  ;;**************************************************************************
1550
1551                                  .SBTTL  TRAP DECODER
1552
1553                                  ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE ''TRAP'' INSTRUCTION
1554                                  ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
1555                                  ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
1556                                  ;*GO TO THAT ROUTINE.
1557
1558  004506  010046                  $TRAP:  MOV     R0,-(SP)                ;;SAVE R0
1559  004510  016600  000002                  MOV     2(SP),R0                ;;GET TRAP ADDRESS
1560  004514  005740                          TST     -(R0)                   ;;BACKUP BY 2
1561  004516  111000                          MOVB    (R0),R0                 ;;GET RIGHT BYTE OF TRAP
1562  004520  016000  004526                  MOV     $TRPAD(R0),R0           ;;INDEX TO TABLE
1563  004524  000200                          RTS     R0                      ;;GO TO ROUTINE
1564
1565
1566                                  .SBTTL  TRAP TABLE
1567
1568                                  ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
1569                                  ;*BY THE ''TRAP'' INSTRUCTION.
1570
1571                                  ;       ROUTINE
1572                                  ;       -------
1573  004526                          $TRPAD:
```

```
1574  004526  003620                          $TYPE   ;;CALL=TYPE     TRAP+0(104400)  TTY TYPEOUT ROUTINE
1575  004530  004060                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
1576  004532  004034                          $TYPOS  ;;CALL=TYPOS    TRAP+4(104404)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
1577  004534  004074                          $TYPON  ;;CALL=TYPON    TRAP+6(104406)  TYPE OCTAL NUMBER (AS PER LAST CALL)
1578  004536  004262                          $TYPDS  ;;CALL=TYPDS    TRAP+10(104410) TYPE DECIMAL NUMBER (WITH SIGN)
1579  004540  003524                          $SAVREG ;;CALL=SAVREG   TRAP+12(104412) SAVE R0-R5 ROUTINE
1580  004542  003562                          $RESREG ;;CALL=RESREG   TRAP+14(104414) RESTORE R0-R5 ROUTINE
1581  004544  005070                          TBITOFF ;;CALL=TBITO    TRAP+16(104416) THIS WILL TURN OFF T BIT TRAPPING
1582  004546  005116                          TBITRESTORE     ;;CALL=TBITR    TRAP+20(104420) THIS WILL RETURN THE T BIT TO PR
1583
1584                                  ;;*****************************************************************
1585
1586                                  .SBTTL  POWER DOWN AND UP ROUTINES
1587
1588                                  ;POWER DOWN ROUTINE
1589  004550  012737  004676  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
1590  004556  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
1591  004564  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
1592  004566  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
1593  004570  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
1594  004572  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
1595  004574  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
1596  004576  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
1597  004600  010637  004702                  MOV     SP,$SAVR6       ;;SAVE SP
1598  004604  012737  004616  000024          MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
1599  004612  000000                          HALT
1600  004614  000776                          BR      .-2             ;;HANG UP
1601
1602                                  ;POWER UP ROUTINE
1603  004616  013706  004702          $PWRUP: MOV     $SAVR6,SP       ;;GET SP
1604  004622  005037  004702                  CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
1605  004626  005237  004702          1$:     INC     $SAVR6          ;;WAIT FOR THE INC
1606  004632  001375                          BNE     1$              ;;OF  WORD
1607  004634  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
1608  004636  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
1609  004640  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
1610  004642  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
1611  004644  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
1612  004646  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
1613  004650  012737  004550  000024          MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
1614  004656  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
1615  004664  104400                          TYPE                    ;;REPORT THE POWER FAILURE
1616  004666  004704          $PWRMG: .WORD   PWRMSG          ;;POWER FAIL MESSAGE POINTER
1617  004670  012716                  MOV     (PC)+,(SP)      ;;RESTART AT START
1618  004672  010000          $PWRAD: .WORD   START           ;;RESTART ADDRESS
1619  004674  000002                  RTI
1620  004676  000000          $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
1621  004700  000776                  BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
1622  004702  000000          $SAVR6: 0                       ;;PUT THE SP HERE
1623  004704  006412  047520  042527  PWRMSG: .ASCIZ  <12><15>?POWER FAILURE, RESTARTING PROGRAM?
1624  004712  020122  040506  046111
1625  004720  051125  026105  051040
1626  004726  051505  040524  052122
1627  004734  047111  020107  051120
1628  004742  043517  040522  000115
1629                                          .EVEN
```

```
                                ;;*****************************************************************

                                .SBTTL  DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE

                                ;*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
                                ;*      JSR     PC,@#$DB20      ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK

004750  104412          $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
004752  016601  000002          MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
004756  012705  005067          MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
004762  012704  000014          MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
004766  012703  177770          MOV     #^C7,R3         ;;MASK
004772  012100                  MOV     (R1)+,R0        ;;LOWER WORD
004774  012101                  MOV     (R1)+,R1        ;;HIGH WORD
004776  005002                  CLR     R2              ;;TERMINATOR
005000  110245          1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
005002  010002                  MOV     R0,R2           ;;GET THIS DIGIT
005004  005304                  DEC     R4              ;;COUNT THIS CHARACTER
005006  003007                  BGT     3$              ;;BR IF NOT THE LAST DIGIT
005010  001405                  BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
005012  005205                  INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
005014  010566  000002          MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
005020  104414                  RESREG                  ;;RESTORE ALL REGISTERS
005022  000207                  RTS     PC              ;;RETURN TO USER
005024  006203          2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
005026  006001          3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
005030  006000                  ROR     R0              ;;      THE NEXT OCTAL DIGIT
005032  006001                  ROR     R1
005034  006000                  ROR     R0
005036  006001                  ROR     R1
005040  006000                  ROR     R0
005042  040302                  BIC     R3,R2           ;;MASK OUT ALL JUNK
005044  062702  000060          ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
005050  000753                  BR      1$              ;;GO PUT IT IN THE DATA TABLE
005052  000016          $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE


                                .SBTTL  ************** SUBROUTINES UNIQUE TO THIS PROGRAM ***************


                                .SBTTL  TURN OFF AND SAVE T-BIT
                                ;;*****************************************************************
                                ;*
                                ;*      THIS SUBROUTINE IS REACHED BY THE TRAP CALL 'TBITO'. IT IS
                                ;*      USED TO TURN OFF THE T-BIT IF IT IS ON.  THE PROCESSOR STATUS
                                ;*      IS SAVED IN "OLDPSW" SO THAT THE T-BIT CAN BE RESTORED TO ITS
                                ;*      PREVIOUS STATUS WHEN CONDITIONS WARRANT.
                                ;*
                                ;;*****************************************************************
```

```
                                        .EQUIV  BIT4,TBIT       ;T-BIT IS BIT04 IN PROC. STATUS
005070                          TBITOFF:
005070  032766  000020  000002          BIT     #TBIT,2(KSP)    ;IS THE T-BIT ON?
005076  001406                          BEQ     1$              ;BRANCH TO EXIT IF IT IS NOT ON
005100  016637  000002  001310          MOV     2(KSP),OLDPSW   ;SAVE OLD PSW FOR RESTORING T BI
005106  042766  000020  000002          BIC     #TBIT,2(KSP)    ;CLEAR T BIT IF IT IS ON
005114  000006                  1$:     RTT                     ;RETURN TO PROGRAM


                                .SBTTL  RESTORE T-BIT TO ITS PREVIOUS CONDITION
                                ;;**************************************************************************
                                ;*
                                ;*      THIS SUBROUTINE CAN BE REACHED BY THE TRAP CALL 'TBITR', IT IS
                                ;*      USED TO RESTORE THE T-BIT AFTER A PARTICULAR TEST THAT CANNOT
                                ;*      BE RUN WITH THE T-BIT ON.  IT USES THE PROCESSOR STATUS STORED
                                ;*      IN ''OLDPSW'' BY 'TBITO', REPLACES THE PS ON THE STACK WITH IT
                                ;*      AND DOES AN 'RTT'.
                                ;*
                                ;;**************************************************************************
005116                          TBITRESTORE:
005116  013766  001310  000002          MOV     OLDPSW,2(KSP)   ;PUT OLD PSW ON STACK
005124  042737  000020  001310          BIC     #TBIT,OLDPSW    ;CLEAR T-BIT IN ''OLDPSW'' SO THAT
                                                                ;IT WON'T BE TURNED ON BY ACCIDENT
005132  000006                          RTT                     ;RETURN TO PROGRAM AND INHIBIT
                                                                ;T BIT TRAP AFTER THIS INSTRUCTION.


                                .SBTTL  SUBROUTINE TO CLEAR ALL OF THE MAP REGISTERS
                                ;;**************************************************************************
                                ;*
                                ;*      THIS SUBROUTINE CLEARS ALL OF THE MAP REGISTERS BY LOADING
                                ;*      THE ADDRESS OF MAPL00 INTO R3 AND THEN CLEARING THE
                                ;*      REGISTER POINTED TO BY R3 UNTIL R3 POINTS ABOVE MAPH37.
                                ;*
                                ;;**************************************************************************
005134  012703  170200  CLRMAP: MOV     #MAPL0,R3       ;PUT FIRST MAP ADDR IN R3
005140  005023          1$:     CLR     (R3)+           ;CLEAR MAP REGS
005142  022703  170376          CMP     #MAPH37,R3      ;SEE IF LAST ADDR IS IN R3
005146  103374                  BHIS    1$              ;BRANCH IF R3 LE THAN LAST ADDR
005150  000207                  RTS     PC              ;RETURN TO MAIN PROGRAM

                                .SBTTL  SUBROUTINE TO LOG AND REPORT TIMEOUTS OF MAP REGISTERS
                                ;;**************************************************************************
                                ;*
                                ;*      THIS SUBROUTINE IS USED TO LOG AND REPORT THE FACT THAT A
                                ;*      REFERENCE TO A MAPPING REGISTER TIMED OUT ON THE UNIBUS.  IT
                                ;*      KEEPS A ''LOGICAL AND'' AND A ''LOGICAL OR'' OF EACH ADDRESS THAT
                                ;*      TIMES OUT.
                                ;*
                                ;;**************************************************************************
005152                          TIMEOUT:                        ;STARTING ADDRESS OF SUBROUTINE
005152  005227                  INC     (PC)+           ;INCREMENT ONE TIME GATE
005154  177777          TOFLAG: .WORD   -1              ;ONE TIME ENTANCE FLAG
005156  001401                  BEQ     10$             ;BRANCH IF FLAG IS NOW ZERO
```

```
                                        HALT                    ;I HAVE ENTERED THIS ROUTINE BEFORE
                                                                ;I FINISHED REPORTING THE FIRST ERROR
                                                                ;THE SECOND ENTRY ADDRESS IS ON THE
                                                                ;STACK AND THE FIRST ERROR CONDITION
                                                                ;IS PROBABLY STILL LOCKED UP .
005162  012637  001304          10$:    MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS
005166  012637  001306                  MOV     (KSP)+,OLDPS    ;SAVE OLD PSW
005172  013737  177766  001266          MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER
005200  013737  001266  177766          MOV     PCPUER,CPUERR   ;CLEAR CPU ERROR REGISTER
005206  023737  001266  001264          CMP     PCPUER,CPUEXP   ;SEE IF EXPECTEED CONDITION CAME UP.
005214  001402                          BEQ     1$              ;BRANCH IF IT WAS A TIMEOUT
005216  104001                          ERROR   1               ;NOT RIGHT CONDITION
005220  000414                          BR      3$              ;BRANCH TO EXIT
005222  050037  001226          1$:     BIS     R0,ADDROR       ;PERFORM LOGIAL OR OF FAILING ADDRESS
005226  005100                          COM     R0              ;GET R0 READY FOR AND
005230  040037  001224                  BIC     R0,ADRAND               ;PERFORM LOGICAL AND
005234  005100                          COM     R0              ;PUT R0 BACK AS IT WAS
005236  005737  001254                  TST     ERRCNT          ;IS THIS THE FIRST ERROR
005242  001002                          BNE     2$              ;BRANCH IF NOT FIRST ERROR
005244  104201                          ERROR   201             ;NO REGISTER RESPONSE.
005246  000401                          BR      3$              ;BRANCH TO EXIT
005250  104301                  2$:     ERROR   301             ;CONTINUE NO RESPONSE TABLE
005252  012737  177777  005154  3$:     MOV     #-1,TOFLAG      ;RESET ONE TIME GATE
005260  013746  001306                  MOV     OLDPS,-(KSP)    ;RESTORE OLD PSW
005264  013746  001304                  MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS BACK ON THE STACK
005270  000006                          RTT                     ;RETURN TO THE TEST

                                .SBTTL  SUBROUTINE TO REPORT MAP REGISTERS THAT WILL NOT HOLD ZERO
                                ;;**************************************************************************
                                ;*
                                ;*      THIS SUBROUTINE IS CALLED EVERY TIME A MAP REGISTER IS CLEARED
                                ;*      AND FOUND TO NOT BE ZERO.  IT KEEPS A LOGICAL ''AND'' AND ''OR'' OF
                                ;*      THE FAILING REGISTER'S ADDRESS AND DATA AND REPORTS ALL ERRORS.
                                ;*      AT THE END OF THE TEST A SUMMARY ERROR MESSAGE IS GIVEN WHICH
                                ;*      WILL REPORT THE LOGICAL ''AND'' AND ''OR'' OF THE ADDRESSES AND DATA.
                                ;*
                                ;;**************************************************************************
005272                          WRITEERROR:
005272  012637  001304                  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF ERROR LOOP
005276  050037  001226                  BIS     R0,ADDROR       ;LOGICAL ''OR'' OF BAD ADDRESS
005302  005100                          COM     R0              ;GET R0 READY FOR AND
005304  040037  001224                  BIC     R0,ADRAND               ;PERFORM LOGICAL AND
005310  005100                          COM     R0              ;PUT R0 BACK AS IT WAS
005312  053737  001170  001232          BIS     $TMP0,DATAOR    ;LOGICAL ''OR'' OF BAD DATA
005320  005137  001170                  COM     $TMP0           ;GET $TMP0 READY FOR AND
005324  043737  001170  001230          BIC     $TMP0,DATAND            ;PERFORM LOGICAL AND
005332  005137  001170                  COM     $TMP0           ;PUT $TMP0 BACK AS IT WAS
005336  005737  001254                  TST     ERRCNT          ;SEE IF THIS IS FIRST ERROR
005342  001002                          BNE     1$              ;BRANCH IF NOT FIRST ERROR
005344  104202                          ERROR   202             ;ERROR TYPE OUT ITEM 4
005346  000401                          BR      2$              ;SKIP NEXT STATEMENT
005350  104302                  1$:     ERROR   302             ;ERROR TYPE OUT ITEM 5
005352  000177  173726          2$:     JMP     @OLDPC          ;RETURN TO THE TEST

                                .SBTTL  SUBROUTINE TO REPORT DUAL ADDRESSING WHEN LOADING A MAP REGISTER
                                ;;**************************************************************************
```

```
                                ;*
                                ;*      THIS SUBROUTINE WILL LOG AND REPORT ALL DUAL ADDRESSING ERRORS
                                ;*      FOUND IN THE MAPPING REGISTERS.  A ''LOGICAL OR'' AND A
                                ;*      ''LOGICAL AND'' OF THE WRITTEN ADDRESSES WILL BE MAINTAINED IN
                                ;*      'ADDROR' AND 'ADRAND'.  THE LOG ON THE ADDITIONAL OR FAILING,
                                ;*      ADDRESSES WILL BE MAINTAINED IN 'DATAOR' AND 'DATAND'.
                                ;*
                                ;;*************************************************************************
005356                          DUALADR:                        ;STARTING LOCATION OF SUBROUTINE
005356  012637  001304                  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
005362  050037  001226                  BIS     R0,ADDROR       ;LOGICAL OR OF WRITTEN ADDRESS
005366  005100                          COM     R0              ;GET R0 READY FOR AND
005370  040037  001224                  BIC     R0,ADRAND               ;PERFORM LOGICAL AND
005374  005100                          COM     R0              ;PUT R0 BACK AS IT WAS
005376  050137  001232                  BIS     R1,DATAOR       ;LOGICAL OR OF DUALED ADDRESS
005402  005101                          COM     R1              ;GET R1 READY FOR AND
005404  040137  001230                  BIC     R1,DATAND               ;PERFORM LOGICAL AND
005410  005101                          COM     R1              ;PUT R1 BACK AS IT WAS
005412  005737  001254                  TST     ERRCNT          ;SEE IF THIS IS FIRST ERROR
005416  001002                          BNE     1$              ;BRANCH IF NOT FIRST ERROR
005420  104203                          ERROR   203
005422  000401                          BR      2$              ;BRANCH TO EXIT
005424  104303                  1$:     ERROR   303
005426  000177  173652          2$:     JMP     @OLDPC          ;RETURN TO TEST

                                .SBTTL  SUBROUTINE TO REPORT COUNT PATTERN ERRORS IN MAP REGISTERS
                                ;;*************************************************************************
                                ;*
                                ;*      THIS SUBROUTINE IS CALLED WHENEVER AN ERROR IS DISCOVERED IN
                                ;*      THE COUNT PATTERN IN THE MAP REGISTERS.  IT KEEPS THE LOGICAL
                                ;*      ''AND'' AND ''OR'' OF THE FAILING REGISTER'S ADDRESS, DATA RECEIVED,
                                ;*      AND PATTERN LOADED.  EVERY ERROR IS REPORTED AND AT THE END OF
                                ;*      A TEST AN ERROR SUMJMARY IS GIVEN.
                                ;*
                                ;;*************************************************************************
005432  012637  001304          COUNT:  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF ERROR LOOP
005436  050037  001226                  BIS     R0,ADDROR       ;LOGICAL OR OF BAD ADDRESSES
005442  005100                          COM     R0              ;GET R0 READY FOR AND
005444  040037  001224                  BIC     R0,ADRAND               ;PERFORM LOGICAL AND
005450  005100                          COM     R0              ;PUT R0 BACK AS IT WAS
005452  050337  001232                  BIS     R3,DATAOR       ;LOGICAL OR OF BAD DATA
005456  005103                          COM     R3              ;GET R3 READY FOR AND
005460  040337  001230                  BIC     R3,DATAND               ;PERFORM LOGICAL AND
005464  005103                          COM     R3              ;PUT R3 BACK AS IT WAS
005466  050437  001236                  BIS     R4,PATTOR       ;LOGICAL OR OF PATTERN LOADED
005472  005104                          COM     R4              ;GET R4 READY FOR AND
005474  040437  001234                  BIC     R4,PATAND               ;PERFORM LOGICAL AND
005500  005104                          COM     R4              ;PUT R4 BACK AS IT WAS
005502  005737  001254                  TST     ERRCNT          ;IS THIS FIRST ERROR
005506  001002                          BNE     1$              ;BRANCH IF NOT FIRST ERROR
005510  104204                          ERROR   204             ;REPORT FIRST COUNT ERROR
005512  000401                          BR      2$              ;SKIP NEXT STATEMENT
005514  104304                  1$:     ERROR   304             ;REPORT MORE DATA
005516  000177  173562          2$:     JMP     @OLDPC          ;RETURN TO THE TEST
```

```
                        .SBTTL  SUBROUTINE TO REPORT COUNT PATTERN ERRORS ON UNIBUS DATA PATH
                        ;;*************************************************************************
                        ;*
                        ;*      THIS SUBROUTINE IS CALLED WHENEVER AN ERROR IS DISCOVERED IN THE
                        ;*      COUNT PATTERN THAT IS RUN OVER THE UNIBUS INTO MAIN MEMORY.  IT
                        ;*      KEEPS THE LOGICAL "AND" AND "OR" OF THE PATTERN LOADED AND THE
                        ;*      DATA RECEIVED, AND REPORTS ALL ERRORS.  AT THE END OF THE TEST
                        ;*      IT GIVES A SUMMARY MESSAGE OF ALL THE ERRORS.
                        ;*
                        ;;*************************************************************************
005522  012637  001304  UBCOUNT:MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF ERROR LOOP
005526  050137  001236          BIS     R1,PATTOR       ;LOGICAL OR OF COUNT LOADED
005532  005101                  COM     R1              ;GET R1 READY FOR AND
005534  040137  001234          BIC     R1,PATAND               ;PERFORM LOGICAL AND
005540  005101                  COM     R1              ;PUT R1 BACK AS IT WAS
005542  050037  001232          BIS     R0,DATAOR       ;LOGICAL OR OF DATA READ
005546  005100                  COM     R0              ;GET R0 READY FOR AND
005550  040037  001230          BIC     R0,DATAND               ;PERFORM LOGICAL AND
005554  005100                  COM     R0              ;PUT R0 BACK AS IT WAS
005556  005737  001254          TST     ERRCNT          ;IS THIS THE FIRST ERROR?
005562  001002                  BNE     1$              ;BRANCH IF NOT FIRST
005564  104205                  ERROR   205             ;REPORT FIRST ERROR ON UNIBUS DATA PATH
005566  000401                  BR      2$              ;SKIP NEXT INSTRUCTION
005570  104305          1$:     ERROR   305             ;REPORT MORE DATA FROM UNIBUS
005572  000177  173506  2$:     JMP     @OLDPC          ;RETURN TO THE TEST

                        .SBTTL  SUBROUTINE TO REPORT COUNT PATTERN ERRORS IN CACHE REGISTERS
                        ;;*************************************************************************
                        ;*
                        ;*      THIS SUBROUTINE IS USED TO LOG AND REPORT THE COUNT PATTERN
                        ;*      ERRORS OCCURRING WHEN TESTING THE CACHE REGISTERS.
                        ;*      THE "LOGICAL OR" AND "LOGICAL AND" OF VARIOUS DATA WILL BE
                        ;*      MAINTAINED AS FOLLOWS:
                        ;*      DATA FETCHED FROM REGISTERS IN 'DATAOR' AND 'DATAND'
                        ;*      PATTERN LOADED INTO THE REGISTERS IN 'PATTOR' AND 'PATAND'.
                        ;*
                        ;;*************************************************************************
005576                  CACOUNT:                        ;STARTING ADDRESS OF THIS SUBROUTINE
005576  012637  001304          MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
005602  050237  001236          BIS     R2,PATTOR       ;LOGICAL OR OF PATTERN LOADED
005606  005102                  COM     R2              ;GET R2 READY FOR AND
005610  040237  001234          BIC     R2,PATAND               ;PERFORM LOGICAL AND
005614  005102                  COM     R2              ;PUT R2 BACK AS IT WAS
005616  050337  001232          BIS     R3,DATAOR       ;LOGICAL OR OF DATA FETCHED
005622  005103                  COM     R3              ;GET R3 READY FOR AND
005624  040337  001230          BIC     R3,DATAND               ;PERFORM LOGICAL AND
005630  005103                  COM     R3              ;PUT R3 BACK AS IT WAS
005632  105737  001103          TSTB    $ERFLG          ;SEE IF THIS IS THE FIRST ERROR
005636  001002                  BNE     1$              ;BRANCH IF NOT FIRST ERROR
005640  104207                  ERROR   207
005642  000401                  BR      2$              ;BRANCH TO EXIT
005644  104307          1$:     ERROR   307
005646  000177  173432  2$:     JMP     @OLDPC          ;RETURN TO TEST
```

```
1910                    .SBTTL  ********** TRAP HANDLING ROUTINES **********
1911
1912                    .SBTTL  CPU TRAP HANDLER ROUTINE
1913                    ;;**************************************************************************
1914                    ;*
1915                    ;*      THIS SUBROUTINE WILL HANDLE ALL CPU TRAPS AND ABORTS, THRU
1916                    ;*      'ERRVEC' (000004).  IF THIS SUBROUTINE IS ENTERED BY A SECOND
```

```
1917                    ;*      TRAP BEFORE THE FIRST HAS BEEN PROCESSED A HALT IS EXECUTED.
1918                    ;*      IF THE WORD 'CPUEXP' IS ZERO, NO TRAP WAS EXPECTED AND AN
1919                    ;*      UNEXPECTED ERROR MESSAGE IS GIVEN.  IF THE WORD 'CPUEXP' IS
1920                    ;*      NOT ZERO THEN THE CPU ERROR REGISTER 'CPUERR' IS COMPARED WITH
```

```
1921                                    ;*      'CPUEXP' TO SEE IF THE PROPER CONDITION OCCURRED.  'PCPUER' CAN
1922                                    ;*      BE USED AS A FLAG TO INDICATE THAT A TRAP HAS OCCURRED SINCE IT
1923                                    ;*      IS LOADED WITH THE ERROR REGISTER IF A TRAP VECTORS HERE
1924                                    ;*
1925                                    ;;**************************************************************************
1926  005652  005227                    CPUER:  INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME
1927  005654  177777                    CPFLAG: .WORD   -1              ;NEGATIVE ONE FOR A FLAG
1928  005656  001401                            BEQ     10$             ;BRANCH IF FIRST TIME IN
1929  005660  000000                            HALT                    ;I HAVE ENTERED THIS ROUTINE BEFORE
1930                                                                    ;I FINISHED REPORTING THE FIRST ERROR
1931                                                                    ;THE SECOND ENTRY ADDRESS IS ON THE
```

```
                                                                ;STACK AND THE FIRST ERROR CONDITION
                                                                ;IS PROBABLY STILL LOCKED UP .
005662  012637  001304          10$:    MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
005666  012637  001306                  MOV     (KSP)+,OLDPS    ;SAVE OLD PSW IN CASE OF LOOP
005672  012706  001100                  MOV     #KERSTK,KSP     ;MAKE SURE THAT THE KERNEL STACK POINTER
                                                                ;IS AT 1100.
005676  013737  177766  001266          MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER
005704  013737  001304  001302          MOV     OLDPC,BADPC     ;SAVE PC+2 AT TIME OF ABORT
005712  005737  001264                  TST     CPUEXP          ;SEE IF ANY CONDITION WAS EXPECTED
005716  001406                          BEQ     2$              ;BRANCH IF NO TRAP WAS EXPECTED
005720  023737  001266  001264          CMP     PCPUER,CPUEXP   ;SEE IF EXPECTED ERROR OCCURED
005726  001403                          BEQ     1$              ;BRANCH IF ERROR CODES MATCH
005730  104001                          ERROR   1               ;WRONG CPU TRAP CONDITION
005732  000401                          BR      1$              ;SKIP NEXT INSTRUCTION
005734  104002                  2$:     ERROR   2               ;NO CPU TRAP EXPECTED
005736  013737  001266  177766  1$:     MOV     PCPUER,CPUERR   ;CLEAR CPU ERROR REGISTER
005744  012737  177777  005654          MOV     #-1,CPFLAG      ;MAKE FLAG NEGATIVE ONE FOR NEXT TIME
005752  013746  001306                  MOV     OLDPS,-(KSP)    ;PUSH OLD PSW BACK ON STACK
005756  013746  001304                  MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS BACK ON STACK
005762  000006                          RTT                     ;RETURN FROM INTERRUPT OR ABORT


                        .SBTTL  CACHE TRAPS AND ABORTS HANDLER ROUTINE
                        ;;**************************************************************************
                        ;*
                        ;*      THIS SUBROUTINE WILL HANDLE ALL UNEXPECTED PARITY ERRORS.  IF
                        ;*      THE PARITY ERROR IS AN ABORT THE TEST THAT WAS RUNNING WILL
                        ;*      BE RESTARTED ONCE AFTER THE ABORT CONDITION IS REPORTED.  ON THE
                        ;*      SECOND ABORT IN A SINGLE TEST THE NEXT TEST IS ATTEMPTED
                        ;*      AFTER THE ABORT IS REPORTED.
                        ;*      IF THE PARITY ERROR IS A TRAP THE CACHE WILL BE CLEANED UP BY
                        ;*      REMOVING THE BAD WORD THAT MAY BE IN THE CACHE, AND THE TEST
                        ;*      WILL BE CONTINUED AFTER THE PARITY ERROR IS REPORTED.
                        ;*
                        ;;**************************************************************************
005764  005227          MEMER:  INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME
005766  177777          PAFLAG: .WORD   -1              ;NEGATIVE ONE FOR A FLAG
005770  001401                  BEQ     10$             ;BRANCH IF FIRST TIME IN
005772  000000                  HALT                    ;I HAVE ENTERED THIS ROUTINE BEFORE
                                                        ;I FINISHED REPORTING THE FIRST ERROR
                                                        ;THE SECOND ENTRY ADDRESS IS ON THE
                                                        ;STACK AND THE FIRST ERROR CONDITION
                                                        ;IS PROBABLY STILL LOCKED UP .
005774  012737  006206  000114  10$:     MOV     #5$,CACHVEC     ;SET CACHE VECTOR TO RTI UNTIL THE
                                                        ;THE CACHE HAS BEEN FIXED.
006002  012637  001304                  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
006006  012637  001306                  MOV     (KSP)+,OLDPS    ;SAVE OLD PSW IN CASE OF LOOP
006012  013737  177740  001270          MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
006020  013737  177742  001272          MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
006026  013737  177744  001274          MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
006034  013737  177746  001276          MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
006042  013737  177750  001300          MOV     @#MAINT,PMAINT  ;SAVE MAINTENENCE REGISTER
006050  013737  001304  001302          MOV     OLDPC,BADPC     ;SAVE PC+2 AT TIME OF ABORT
006056  032737  000014  001274          BIT     #14,PPARER      ;WAS THIS A MAIN MEMORY REFERENCE
006064  001005                          BNE     1$              ;BRANCH IF MAIN MEMORY PARITY ERROR
```

```
                                                ;LOAD ADDRESS OF THIS ROUTINE IN VECTOR
                                                ;UNEXPECTED PARITY ABORT
                                                ;BRANCH TO SUBROUTINE EXIT
                                                ;SAVE R0 ON STACK
                                                ;PUT LOW 16 BITS OF BAD ADDR IN R0
                                                ;CLEAR UPPER 6 BITS OF ADDRESS
                                                ;REFERENCE OTHER WORD OF PAIR
                                                ;READ AT SAME INDEX AS BAD WORD
                                                ;RESTORE R0 FROM STACK
                                                ;LOAD ADDRESS OF THIS ROUTINE IN VECTOR
                                                ;MAIN MEMORY PARITY ERROR
                                                ;ARE YOU RETRYING THIS TEST?
                                                ;BRANCH IF THIS IS SECOND TRY
                                                ;SET RETRY FLAG
                                                ;RETURN TO START OF THIS TEST
                                                ;BRANCH TO EXIT
                                                ;RETURN TO START OF NEXT TEST
                                                ;SINCE THIS IS THE SECOND ABORT
                                                ;CLEAR MEMORY ERROR REGISTER
                                                ;RESTORE A NEGATIVE ONE FOR NEXT TIME
                                                ;PUSH OLD PSW BACK ON STACK
                                                ;PUSH RETURN ADDRESS BACK ON STACK
                                                ;RETURN FROM INTERRUPT.


                                .SBTTL  MEMORY MANAGEMENT TRAPS AND ABORTS HANDLER ROUTINE
                                ;;**************************************************************************
                                ;*
                                ;*      THIS  ROUTINE WILL HANDLE ALL SPURIOUS MEMORY MANAGEMENT TRAPS
                                ;*      AND ABORTS.  IT WILL REPORT THE CONDITION OF ALL THE MEMORY
                                ;*      MAMAGEMENT STATUS REGISTERS, AND THEN RETURN TO THE TEST AND
                                ;*      TRY TO CONTINUE RUNNING.
                                ;*
                                ;;**************************************************************************
                                MMTRAP: INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME
                                MMFLAG: .WORD   -1              ;FLAG SHOULD BE NEG ONE
                                        BEQ     10$             ;BRANCH IF FIRST TIME INTO ROUTINE
                                        HALT                    ;I HAVE ENTERED THIS ROUTINE BEFORE
                                                                ;I FINISHED REPORTING THE FIRST ERROR
                                                                ;THE SECOND ENTRY ADDRESS IS ON THE
                                                                ;STACK AND THE FIRST ERROR CONDITION
                                                                ;IS PROBABLY STILL LOCKED UP .
                                10$:    MOV     (KSP),BADPC     ;SAVE PC AT TIME OF ABORT OR TRAP
                                        MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
                                        MOV     (KSP)+,OLDPS    ;SAVE OLD PSW IN CASE OF LOOP
                                        MOV     MMR0,PMMR0      ;SAVE STATUS REGISTER
                                        MOV     MMR1,PMMR1      ;SAVE AUTO INC/DEC REGISTER
                                        MOV     MMR2,PMMR2      ;SAVE VIRTUAL ADDRESS REGISTER
                                        ERROR   5               ;UNEXPECTED M.M. ABORT OR TRAP
                                1$:     BIC     #177776,@#MMR0  ;CLEAR ALL BITS EXCEPT 0
                                        MOV     #-1,MMFLAG      ;RESTORE A NEGATIVE ONE TO FLAG
                                        MOV     OLDPS,-(KSP)    ;PUSH OLD PSW ONTO STACK
                                        MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS ON STACK
                                        RTT                     ;RETURN TO MAIN PROGRAM
```

```
                                        .SBTTL  ******************************************************************************
                                        .SBTTL  ********************* START OF TEST CODE ***********************************
            010000                      .=10000         ;START TEST CODE AT ADDRESS 10000 (2K)

010000                                  START:
010000  012737  000340  177776                  MOV     #340,@#PS       ;;LOCK OUT ALL INTERRUPTS
010006  012706  001100                          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
010012  005026                                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
010014  022706  001136                          CMP     #$TKS,R6        ;;DONE?
010020  001374                                  BNE     .-6             ;;LOOP BACK IF NO
010022  012706  001100                          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
010026  012737  002214  000020                  MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
010034  012737  000340  000022                  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
010042  012737  002534  000030                  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
010050  012737  000340  000032                  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
010056  012737  004506  000034                  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
010064  012737  000340  000036                  MOV     #340,@#TRAPVEC+2;LEVEL 7
010072  012737  004550  000024                  MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
010100  012737  000340  000026                  MOV     #340,@#PWRVEC+2 ;;LEVEL 7
010106  013737  024414  024406                  MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
010114  005037  001204                          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
010120  005037  001206                          CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
010124  112737  000001  001115                  MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
010132  012737  024634  000014                  MOV     #$RTRN,@#TBITVEC ;;SET 'T' BIT VECTOR TO $RTRN
010140  012737  000340  000016                  MOV     #340,@#TBITVEC+2 ;;LEVEL 7
010146  012737  000002  024634                  MOV     #RTI,$RTRN      ;;SET $RTRN TO A RTI
010154  012737  010202  000010                  MOV     #65$,@#RESVEC   ;;TRY TO DO A RTT
010162  005046                                  CLR     -(SP)           ;;DUMMY PS
010164  012746  010172                          MOV     #64$,-(SP)      ;;AND PC
010170  000006                                  RTT                     ;;TRY THE RTT
010172  012737  000006  024634  64$:           MOV     #RTT,$RTRN      ;;RTT IS LEGAL--SET $RTRN TO A RTT
010200  000402                                  BR      66$
010202  062706  000010          65$:           ADD     #10,SP          ;;RTT ILLEGAL--CLEAN OFF THE STACK
010206  012737  000012  000010  66$:           MOV     #RESVEC+2,@#RESVEC ;;RESTORE TRAP CATCHER
010214  005037  024642                          CLR     $TBIT           ;;CLEAR 'T' BIT SWITCH
010220  012737  010220  001106                  MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
010226  012737  010226  001110                  MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
010234  005227  177777                          INC     #-1             ;;FIRST TIME?
010240  001037                                  BNE     67$             ;;BRANCH IF NO
010242  022737  024566  000042                  CMP     #$ENDAD,@#42    ;;ACT-11?
010250  001433                                  BEQ     67$             ;;BRANCH IF YES
010252  104400  010260                          TYPE    ,68$            ;;TYPE ASCIZ STRING
010256  000430                                  BR      67$             ;;GET OVER THE ASCIZ
                                        ;;68$:  .ASCIZ  <CRLF>?CEKBFC  PDP-11/70-74MP UNIBUS MAP DIAGNOSTIC?<CRLF>
010340                                  67$:
                                        ;;
                                        ;;*** TEST FOR VARIOUS KB11 PROCESSORS ***
                                        ;;
                                        ;;*THIS ROUTINE POLES THE RESULTS OF ATTEMPTS TO SET TO ONE
                                        ;;*CERTAIN CRITICAL BITS THAT ARE KNOWN TO BE OPERATIVE ON A KB11CM,
                                        ;;*OR KB11EM PROCESSOR. IF TWO OUT OF FOUR OF THE TESTS ARE
                                        ;;*POSITIVE THEN THE KB11CM OR KB11EM FLAG IS SET,IF LESS THAN TWO OF THE
                                        ;;*TESTS ARE POSITIVE THEN THE KB11E FLAG OR NO FLAG IS SET. THE DETERMINATION
```

```
2100                                    ;;*OF WHICH PAIR IS VALID IS BASED ON THE RESULTS OF EXECUTING AN MFPT OPCODE
2101                                    ;;*(OPCODE 7).  IF THIS INSTRUCTION TRAPS THIS IS AN KB11CM OR
2102                                    ;;*A PLAIN 1170 (KB11-B OR KB11-C).  IF THE INSTRUCTION DOES NOT TRAP THEN
2103                                    ;;*THIS IS A KB11-E OR KB11-EM.
2104                                    ;
2105  010340  105037  001332           KBTST:  CLRB    @#KB11CM        ;RESET THE MP FLAG
2106  010344  005037  001330                   CLR     @#KB11E         ;CLEAR KB11E AND KB11EM FLAGS
2107  010350  012737  010606  000010           MOV     #MFPTTR,@#RESVEC ;SET UP TRAP ADDRESS FOR MFPT AT RESERV VECTOR
2108  010356  000007                           MFPT                    ;EXECUTE MFPT. WILL TRAP ON 1170 (KB11B/C) OR
2109                                                                    ;KB11CM (11/74                )
2110  010360  012737  000001  001330           MOV     #1,@#KB11E      ;HERE IF KB11E OR KB11EM. SET FLAG
2111  010366  005037  177750           T1:     CLR     @#MAINT         ;CLEAR THE MAINTENANCE REGISTER
2112  010372  005005                           CLR     R5              ;RESET THE TEST COUNTER
2113  010374  012700  177746                   MOV     #CONTRL,R0      ;GET THE ADDRESS OF...
2114  010400  012701  177750                   MOV     #MAINT,R1       ;CCR,MAINT,AND MAPH00...
2115  010404  012702  170202                   MOV     #MAPH00,R2      ;AND PLACE IN R0-R2
2116  010410  052710  040000                   BIS     #BIT14,(R0)     ;TRY TO SET IVSS BIT
2117  010414  032710  040000                   BIT     #BIT14,(R0)     ;DID IT SET?
2118  010420  001403                           BEQ     T2              ;NO,GO TO NEXT TEST
2119  010422  042710  040000                   BIC     #BIT14,(R0)     ;CLEAR IT.
2120  010426  005205                           INC     R5              ;TEST IS POSITIVE
2121  010430  052711  000001           T2:     BIS     #BIT0,(R1)      ;SET EDMA IN MAINT REGISTER
2122  010434  032711  000001                   BIT     #BIT0,(R1)
2123  010440  001410                           BEQ     T3
2124  010442  052710  004000                   BIS     #BIT11,(R0)     ;TRY TO SET DMMA IN CCR
2125  010446  032710  004000                   BIT     #BIT11,(R0)
2126  010452  001403                           BEQ     T3
2127  010454  042710  004000                   BIC     #BIT11,(R0)
2128  010460  005205                           INC     R5
2129  010462  042711  000001           T3:     BIC     #BIT0,(R1)      ;MAKE SURE EDMA IS CLEAR
2130  010466  052737  100000  172300           BIS     #BIT15,KIPDR0   ;TRY TO SET BYP ON A PDR
2131  010474  032737  100000  172300           BIT     #BIT15,KIPDR0
2132  010502  001404                           BEQ     T4
2133  010504  042737  100000  172300           BIC     #BIT15,KIPDR0
2134  010512  005205                           INC     R5
2135  010514  052712  100000           T4:     BIS     #BIT15,(R2)     ;TRY TO SET BYP ON UNIBUS MAP
2136  010520  032712  100000                   BIT     #BIT15,(R2)
2137  010524  001403                           BEQ     T.END
2138  010526  042712  100000                   BIC     #BIT15,(R2)
2139  010532  005205                           INC     R5
2140  010534  022705  000002           T.END:  CMP     #2,R5           ;IS THE RESULT OF THE TEST >=2
2141  010540  101021                           BHI     2$              ;NO,THIS IT A KB11E OR KB11-B/C (11/70)
2142  010542  005000                           CLR     R0
2143  010544  005037  177746                   CLR     @#CONTRL
2144  010550  013701  177746           3$:     MOV     @#CONTRL,R1
2145  010554  001402                           BEQ     4$
2146  010556  005200                           INC     R0
2147  010560  001373                           BNE     3$
2148  010562                           4$:
2149  010562  005737  001330                   TST     @#KB11E         ;IS IS A KB11-E OR KB11-EM?
2150  010566  001404                           BEQ     1$              ;BR IF NEITHER. MUST BE KB11CM
2151  010570  012737  000400  001330           MOV     #BIT8,@#KB11E   ;SET UPPER BYTE (KB11-EM)
2152  010576  000402                           BR      2$              ;DONE
2153  010600  105237  001332           1$:     INCB    @#KB11CM        ;YES, FLAG THIS AS A MODIFIED PROCESSOR
2154  010604  000403                   2$:     BR      ENDKB           ;DONE DETERMINING WHICH CPU
2155
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```
2156  010606                          MFPTTR:                         ;HERE IF MFPT TRAPPED. SEE IF 1170 OR KB11CM
2157  010606  012716  010366                 MOV     #T1,(SP)         ;SET UP RETURN ADDRESS FOR RTI
2158  010612  000002                          RTI                      ;RETURN
2159  010614                          ENDKB:
2160  010614  005227  177777                 INC     #-1              ;FIRST TIME?
2161  010620  001026                          BNE     100$             ;BR IF NO
2162  010622  104400  024650                 TYPE    ,MSG1            ;<15><12>CPU UNDER TEST FOUND TO BE A
2163  010626  005737  001330                 TST     @#KB11E          ;IS THIS A KB11-E OR KB11-EM?
2164  010632  001011                          BNE     101$             ;BR IF EITHER ONE
2165  010634  105737  001332                 TSTB    @#KB11CM         ;IS IT A 11/74          (KB11CM)
2166  010640  001003                          BNE     1$               ;BR IF IT IS
2167  010642  104400  024720                 TYPE    ,MSG3            ;KB11-B/C<15><12>
2168  010646  000413                          BR      100$             ;SKIP OTHER MESSAGE
2169  010650  104400  024732          1$:     TYPE    ,MSG4            ;11/74          (KB11CM)<15><12>
2170  010654  000410                          BR      100$             ;SKIP CISP MESSAGE
2171  010656  105737  001330          101$:   TSTB    @#KB11E          ;IS IT A KB11-E?
2172  010662  001403                          BEQ     102$             ;BR IF NOT. MUST BE KB11-EM
2173  010664  104400  024763                 TYPE    ,MSG5            ;KB11-E<15><12>
2174  010670  000402                          BR      100$             ;SKIP KB11-EM MESSAGE
2175  010672  104400  024707          102$:   TYPE    ,MSG2            ;KB11-EM<15><12>
2176  010676                          100$:
2177  010676  012737  005764  000114  LOOP:   MOV     #MEMER,CACHVEC   ;LOAD PARITY ERROR SERVICE
2178                                                                   ;ROUTINE ADDRESS
2179  010704  012737  000340  000116          MOV     #340,CACHVEC+2   ;SET PRIORITY SEVEN
2180  010712  012737  006210  000250          MOV     #MMTRAP,MMVEC    ;LOAD MEMORY MANAGEMENT TRAP
2181                                                                   ;SERVICE ROUTINE ADDRESS
2182  010720  012737  000340  000252          MOV     #340,MMVEC+2     ;SET PRIORITY SEVEN
2183  010726  012737  005652  000004          MOV     #CPUER,ERRVEC    ;LOAD CPU TRAP SERVICE ROUTINE ADDR
2184  010734  012737  000340  000006          MOV     #340,ERRVEC+2    ;SET PRIORITY SEVEN
2185  010742  012727  000044  177770          MOV     #044,#177770     ;LOAD ROM ADDRESS OF 'NOP'' INTO MICRO
2186                                                                   ;BREAK REGISTER.  EVERY 'NOP'' WILL
2187                                                                   ;GENERATE A 'SYNC'' PULSE ON PIN
2188                                                                   ;#AE1 SLOT 10
2189  010750  005037  001264                 CLR     CPUEXP           ;NOT EXPECTING ANY CPU ERRORS
2190  010754  005037  177572                 CLR     @#MMR0           ;START IN 16 BIT MAPPING
2191  010760  005037  172516                 CLR     @#MMR3           ;DISABLE MAP AND 22-BIT MAPPING
2192  010764  012700  177777                 MOV     #-1,R0           ;NEGATIVE ONE USED TO INITIALIZE FLAGS
2193  010770  010037  005654                 MOV     R0,CPFLAG        ;INITIALIZE FLAGS
2194  010774  010037  005154                 MOV     R0,TOFLAG        ;INITIALIZE FLAGS
2195  011000  010037  005766                 MOV     R0,PAFLAG        ;INITIALIZE FLAGS
2196  011004  010037  006212                 MOV     R0,MMFLAG        ;INITIALIZE FLAGS
2197  011010  010037  177744                 MOV     R0,@#MEMERR      ;CLEAR PARITY ERROR REGISTER
2198  011014  010037  177766                 MOV     R0,@#CPUERR      ;CLEAR CPU ERROR REGISTER
2199
2200                                  ;*THE FOLLOWING TWO TESTS ARE USED TO VERIFY THAT SOMETHING
2201                                  ;*RESPONDS WHEN THE MAP REGISTERS AND CACHE REGISTERS ARE
2202                                  ;*REFERENCED.  THE SIGNALS THAT SHOULD BE GENERATED ARE:
2203                                  ;*'MAPB REG OP H' AND 'MAPB CACHE REG H'. UNDER PROPER
2204                                  ;*OPERATION EITHER SIGNAL SHOULD CAUSE 'BUS SSYN L' TO BE
2205                                  ;*ASSERTED AND NO TIMEOUT WILL OCCUR.
2206
2207                                  ;;*****************************************************************
2208                                  ;*TEST 1         MAP REGISTER RESPONSE TEST
2209                                  ;*
2210                                  ;*       THIS TEST IS USED TO ENSURE THAT ALL THE UNIBUS MAP REGISTERS
2211                                  ;*       CAN BE REFERENCED UNDER PROGRAM CONTROL, WITHOUT TIMING OUT.
```

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                                ;*      THE ADDRESSES OF ANY MAP REGISTERS THAT TIME OUT WILL BE REPORTED
                                ;*      AND, AT THE END OF THE TEST, A SUMMARY OF THOSE REGISTERS WILL
                                ;*      BE GIVEN.  THE ADDRESS DECODE CIRCUITRY IS ON 'MAPB' AND 'MAPC'.
                                ;*
                                ;;*****************************************************************
011020                          TST1:
011020  000004                          SCOPE
011022  012737  011104  001324          MOV     #TST2,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
011030  012737  005152  000004  20$:     MOV     #TIMEOUT,ERRVEC ;LOAD ERRVEC WITH ROUTINE ADDR.
011036  012700  170200                  MOV     #MAPL0,R0       ;PUT FIRST MAP REG ADDR IN R0
011042  012737  011050  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
011050  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
011052  011002                          MOV     (R0),R2         ;READ MAP REGISTERS TO R2
011054  062700  000002                  ADD     #2,R0           ;POINT TONEXT MAP REGISTER
011060  022700  170376                  CMP     #MAPH37,R0      ;COMPARE LAST MAP REG ADDR WITH R0
011064  103371                          BHIS    1$              ;CONTINUE READING IF NOT AT LAST REG.
011066  012737  011030  001110          MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
                                                                ;OF INTERMITTENT FAULTS.
011074  005737  001254                  TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
011100  001401                          BEQ     TST2            ;;NO ERRORS GO TO NEXT TEST
011102  104006                          ERROR   6               ;SUMMARY OF MAP REGISTERS THAT TIMED OUT

                                ;;*****************************************************************
                                ;*TEST 2         CACHE REGISTER RESPONSE TEST

                                ;*
                                ;*      THIS TEST IS USED TO ENSURE THAT ALL THE CACHE REGISTERS
                                ;*      CAN BE REFERENCED UNDER PROGRAM CONTROL, WITHOUT TIMING OUT.
                                ;*      THE ADDRESSES OF ANY CACHE REGISTERS THAT TIME OUT WILL BE
                                ;*      REPORTED AND, AT THE END OF THE TEST, A SUMMARY OF THOSE REGISTERS
                                ;*      WILL BE GIVEN.
                                ;*      THESE REGISTERS ARE TESTED HERE BECAUSE THE ADDRESS DECODE AND DATA
                                ;*      PATH IS ON THE UNIBUS MAP BOARD (8141).  THE ADDRESS DECODE CIRCUITRY
                                ;*      IS ON 'MAPB' AND GENERATES 'MAPB CACHE REG'.
                                ;*
                                ;;*****************************************************************
011104                          TST2:
011104  000004                          SCOPE
011106  012737  011162  001324          MOV     #TST3,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
011114  012700  177740          20$:    MOV     #LOADRS,R0      ;PUT ADDR OF FIRST CACHE REG IN R0
011120  012737  011126  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER HERE
011126  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
011130  011002                          MOV     (R0),R2         ;TRY TO READ ALL CACHE REGISTERS
011132  062700  000002                  ADD     #2,R0           ;POINT TO NEXT CACHE REGISTER
011136  022700  177752                  CMP     #HITMIS,R0      ;HAVE ALL REGISTERS BEEN REFERENCED?
011142  103371                          BHIS    1$              ;BRANCH IF MORE TO TEST
011144  012737  011114  001110          MOV     #20$,$LPERR     ;INITIALIZE LOOPING ERROR IN CASE
                                                                ;OF INTERMITTENT FAULTS
011152  005737  001254                  TST     ERRCNT          ;WERE THERE ANY ERRORS.
011156  001401                          BEQ     TST3            ;;BRANCH IF NO ERRORS
011160  104007                          ERROR   7               ;SUMMARY OF CACHE REGISTERS THAT TIMED OUT

                                ;*THE NEXT FOUR (4) TESTS ARE USED TO CHECK THE GENERATION
                                ;*OF: 'MAPB WRITE HI WORD L' AND 'MAPB WRITE LOWORD L'.
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                        ;*ALL REGISTERS ARE CLEARED AND THEN READ AND CHECKED FOR
                        ;*ZEROES.  THESE TESTS ALSO DETECT BITS IN THE DATA PATH
                        ;*TO AND FROM THE MAP REGISTERS OR IN THE MAP REGISTERS STUCK
                        ;*AT "1".  THE RECEIVERS ON PAGE MAPA AND THE B & C INPUTS
                        ;*TO THE MULTIPLEXERS ON PAGE MAPJ AND THE DRIVERS ON PAGE
                        ;*MAPJ MAKE UP THE DATA PATH UNDER TEST HERE.

                        ;;*****************************************************************
                        ;*TEST 3        CLEAR AND READ LOW 20 REGISTERS LOWER 16 BITS
                        ;*
                        ;*      THIS TEST WILL ENSURE THAT MAPL00 - MAPL17 WILL ALL HOLD ZERO.
                        ;*      IF ANY REGISTERS ARE NOT ZERO AFTER BEING CLEARED, THEIR ADDRESS AND
                        ;*      CONTENTS ARE REPORTED.  IF ALL THE REGISTERS HAVE RANDOM DATA THEN
                        ;*      PROBABLY NO WRITE PULSE IS BEING GENERATED, BUT IF THE ERROR IS IN
                        ;*      ONLY ONE REGISTER OR IN ONE BIT IT MIGHT BE MORE DIFFICULT TO FIND.
                        ;*      IT IS POSSIBLE THAT THE COUNT PATTERN TEST FOR MAPL00 - MAPL17 WILL
                        ;*      GIVE MORE HELP.
                        ;*
                        ;;*****************************************************************
011162                  TST3:
011162  000004                SCOPE
011164  012737  011260  001324    MOV     #TST4,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST
                                                          ;FOR ESCAPE ON PARITY ERRORS
011172  012737  005652  000004    MOV     #CPUER,ERRVEC   ;LOAD CPU TRAP SERVICE ROUTINE ADDR
011200  012700  170200    20$:    MOV     #MAPL0,R0       ;LOAD STARTING MAP REGISTER ADDR
011204  012737  011212  001110    MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER HERE
011212  000240            1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
011214  005010                    CLR     (R0)            ;CLEAR MAP REGISTER
011216  011037  001170            MOV     (R0),$TMP0      ;SEE IF MAP REGISTER IS ZERO
011222  001402                    BEQ     2$              ;BRANCH IF REGISTER IS ZERO
011224  004737  005272            JSR     PC,WRITEERROR   ;REPORT AND LOG ERROR
011230  062700  000004    2$:     ADD     #4,R0           ;POINT TO NEXT MAP REG LOWER 16 BITS
011234  022700  170274            CMP     #MAPL17,R0      ;SEE IF THIS SECTION IS TESTED
011240  103364                    BHIS    1$              ;BRANCH IF NOT
011242  012737  011200  001110    MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
                                                          ;OF INTERMITTENT FAULTS.
011250  005737  001254            TST     ERRCNT          ;WERE THERE ANY ERRORS ON THIS TEST
011254  001401                    BEQ     TST4            ;;BRANCH IF NO ERRORS
011256  104010                    ERROR   10              ;SUMMARY OF MAP REGS THAT COULD NOT
                                                          ;HOLD ZERO


                        ;;*****************************************************************
                        ;*TEST 4        CLEAR AND READ LOW 20 REGISTERS UPPER 6 BITS
                        ;*
                        ;*      THIS TEST WILL ENSURE THAT MAPH00 - MAPH17 WILL ALL HOLD ZERO.
                        ;*      IF ANY REGISTERS ARE NOT ZERO AFTER BEING CLEARED, THEIR ADDRESS AND
                        ;*      CONTENTS ARE REPORTED.  IF ALL THE REGISTERS HAVE RANDOM DATA THEN
                        ;*      PROBABLY NO WRITE PULSE IS BEING GENERATED, BUT IF THE ERROR IS IN
                        ;*      ONLY ONE REGISTER OR IN ONE BIT IT MIGHT BE MORE DIFFICULT TO FIND.
                        ;*      IT IS POSSIBLE THAT THE COUNT PATTERN TEST FOR MAPH00 - MAPH17 WILL
                        ;*      GIVE MORE HELP.
                        ;*
                        ;;*****************************************************************
011260                  TST4:
011260  000004                SCOPE
```

```
2324  011262  012737  011350  001324          MOV     #TST5,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST
2325                                                                    ;FOR ESCAPE ON PARITY ERRORS
2326  011270  012700  170202          20$:    MOV     #MAPH0,R0       ;LOAD STARTING MAP REGISTER ADDR
2327  011274  012737  011302  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER HERE
2328  011302  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2329  011304  005010                          CLR     (R0)            ;CLEAR MAP REGISTER
2330  011306  011037  001170                  MOV     (R0),$TMP0      ;SEE IF MAP REGISTER IS ZERO
2331  011312  001402                          BEQ     2$              ;BRANCH IF REGISTER IS ZERO
2332  011314  004737  005272                  JSR     PC,WRITEERROR   ;REPORT AND LOG ERROR
2333  011320  062700  000004          2$:     ADD     #4,R0           ;POINT TO NEXT MAP REG UPPER 6 BITS
2334  011324  022700  170276                  CMP     #MAPH17,R0      ;SEE IF TESTING IS OVER
2335  011330  103364                          BHIS    1$              ;BRANCH IF MORE REGS TO TEST
2336  011332  012737  011270  001110          MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
2337                                                                    ;OF INTERMITTENT FAULTS.
2338  011340  005737  001254                  TST     ERRCNT          ;WHERE THERE ANY ERRORS ON THIS
2339  011344  001401                          BEQ     TST5            ;;BRANCH IF NO ERRORS
2340  011346  104011                          ERROR   11              ;SUMMARY OF MAP REGS THAT COULD NOT
2341                                                                    ;HOLD ZERO
2342
2343
2344                                  ;;**********************************************************************
2345                                  ;*TEST 5         CLEAR AND READ HIGH 20 REGISTERS LOWER 16 BITS
2346                                  ;*
2347                                  ;*      THIS TEST WILL ENSURE THAT MAPL20 - MAPL37 WILL ALL HOLD ZERO.
2348                                  ;*      IF ANY REGISTERS ARE NOT ZERO AFTER BEING CLEARED, THEIR ADDRESS AND
2349                                  ;*      CONTENTS ARE REPORTED.  IF ALL THE REGISTERS HAVE RANDOM DATA THEN
2350                                  ;*      PROBABLY NO WRITE PULSE IS BEING GENERATED, BUT IF THE ERROR IS IN
2351                                  ;*      ONLY ONE REGISTER OR IN ONE BIT IT MIGHT BE MORE DIFFICULT TO FIND.
2352                                  ;*      IT IS POSSIBLE THAT THE COUNT PATTERN TEST FOR MAPL20 - MAPL37 WILL
2353                                  ;*      GIVE MORE HELP.
2354                                  ;*
2355                                  ;;**********************************************************************
2356  011350                          TST5:
2357  011350  000004                          SCOPE
2358  011352  012737  011440  001324          MOV     #TST6,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST
2359                                                                    ;FOR ESCAPE ON PARITY ERRORS
2360  011360  012700  170300          20$:    MOV     #MAPL20,R0      ;LOAD STARTING MAP REGISTER ADDR
2361  011364  012737  011372  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER HERE
2362  011372  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2363  011374  005010                          CLR     (R0)            ;CLEAR MAP REGISTER
2364  011376  011037  001170                  MOV     (R0),$TMP0      ;SEE IF MAP REGISTER IS ZERO
2365  011402  001402                          BEQ     2$              ;BRANCH IF REGISTER IS ZERO
2366  011404  004737  005272                  JSR     PC,WRITEERROR   ;REPORT AND LOG ERROR
2367  011410  062700  000004          2$:     ADD     #4,R0           ;POINT TO NEXT REGISTER
2368  011414  022700  170374                  CMP     #MAPL37,R0      ;SEE IF THIS SECTION IS TESTED
2369  011420  103364                          BHIS    1$              ;BRANCH IF NOT
2370  011422  012737  011360  001110          MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
2371                                                                    ;OF INTERMITTENT FAULTS.
2372  011430  005737  001254                  TST     ERRCNT          ;WERE THERE ANY ERRORS ON THIS
2373  011434  001401                          BEQ     TST6            ;;BRANCH IF NO ERRORS
2374  011436  104010                          ERROR   10              ;SUMMARY OF MAP REGS THAT COULD NOT
2375                                                                    ;HOLD ZERO
2376
2377
2378                                  ;;**********************************************************************
2379                                  ;*TEST 6         CLEAR AND READ HIGH 20 REGISTERS UPPER 6 BITS
```

```
                        ;*
                        ;*      THIS TEST WILL ENSURE THAT MAPH20 - MAPH37 WILL ALL HOLD ZERO.
                        ;*      IF ANY REGISTERS ARE NOT ZERO AFTER BEING CLEARED, THEIR ADDRESS AND
                        ;*      CONTENTS ARE REPORTED.  IF ALL THE REGISTERS HAVE RANDOM DATA THEN
                        ;*      PROBABLY NO WRITE PULSE IS BEING GENERATED, BUT IF THE ERROR IS IN
                        ;*      ONLY ONE REGISTER OR IN ONE BIT IT MIGHT BE MORE DIFFICULT TO FIND.
                        ;*      IT IS POSSIBLE THAT THE COUNT PATTERN TEST FOR MAPH20 - MAPH37 WILL
                        ;*      GIVE MORE HELP.
                        ;*
                        ;;*****************************************************************
011440                  TST6:
011440  000004                SCOPE
011442  012737  011530  001324  MOV     #TST7,NXTTST    ;SAVE STARTING ADDRESS OF NEXT TEST
                                                        ;FOR ESCAPE ON PARITY ERRORS
011450  012700  170302  20$:    MOV     #MAPH20,R0      ;LOAD STARTING MAP REGISTER ADDR
011454  012737  011462  001110  MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER HERE
011462  000240          1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
011464  005010                  CLR     (R0)            ;CLEAR MAP REGISTER
011466  011037  001170          MOV     (R0),$TMP0      ;SEE IF MAP REGISTER IS ZERO
011472  001402                  BEQ     2$              ;BRANCH IF REGISTER IS ZERO
011474  004737  005272          JSR     PC,WRITEERROR   ;REPORT AND LOG ERROR
011500  062700  000004  2$:     ADD     #4,R0           ;POINT TO NEXT HIGH REGISTER
011504  022700  170376          CMP     #MAPH37,R0      ;SEE IF THERE ARE MORE REGS LEFT
011510  103364                  BHIS    1$              ;BRANCH IF MORE REGS TO TEST
011512  012737  011450  001110  MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
                                                        ;OF INTERMITTENT FAULTS.
011520  005737  001254          TST     ERRCNT          ;WERE THERE ANY ERRORS ON THIS TEST
011524  001401                  BEQ     TST7            ;;BRANCH IF NO ERRORS
011526  104011                  ERROR   11              ;SUMMARY OF MAP REGS THAT COULD NOT
                                                        ;HOLD ZERO

                        ;*IN THE NEXT TWO TESTS A COUNT PATTERN IS RUN THROUGH
                        ;*MAP REGISTER 00 TO TEST THE DATA PATH TO AND FROM THE
                        ;*MAP REGISTERS.  THE DATA RECEIVERS ARE ON PAGE MAPA, AND
                        ;*THE DATA DRIVERS ARE ON PAGE MAPJ.  THE BINPUTS TO THE
                        ;*MULTIPLEXERS ON PAGE MAPJ ARE USED WHEN READING THE LOWER 16 BITS (TEST 7) AND
                        ;*THE C INPUTS ARE USED WHEN READING THE UPPER 6 BITS OF THE
                        ;*MAP REGISTER (TEST 10).  IF REGISTER 0 FAILS THEN REGISTER 20
                        ;*IS TRIED AND THE ERROR IS REPORTED EVEN IF REGISTER 20 SUCCEEDS.

                        ;;*****************************************************************
                        ;*TEST 7        DATA PATH TEST TO MAP REGISTER LOWER 16 BITS
                        ;*
                        ;*      THIS TEST WILL ENSURE THAT THE DATA PATH TO AND FROM THE UNIBUS
                        ;*      MAP REGISTERS IS FUNCTIONING PROPERLY.  IT RUNS A COUNT PATTERN
                        ;*      THROUGH MAPL00, AND IF IT DETECTS AN ERROR THE EXPECTED COUNT
                        ;*      AND THE RECEIVED COUNT ARE REPORTED.  THE TEST THEN TRIES TO RUN
                        ;*      THE COUNT THROUGH MAPL20, IN CASE THE ERROR IS IN THE LOWER
                        ;*      GROUP OF REGISTERS AND NOT IN THE DATA PATH.
                        ;*      THE DATA INPUT TO THE MAP REGISTERS IS RECEIVED FROM THE UNIBUS
                        ;*      ON 'MAPA' AND THE OUTPUT TO THE UNIBUS IS DRIVEN ON 'MAPJ'.
                        ;*
                        ;;*****************************************************************
011530                  TST7:
011530  000004                SCOPE
011532  012737  011654  001324  MOV     #TST10,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
```

```
2436
2437  011540  012737  000012  001204          MOV     #12,$TIMES      ;FOR ESCAPE ON PARITY ERRORS
2438  011546  005003                  20$:     CLR     R3              ;;DO 12 ITERATIONS
2439  011550  005002                          CLR     R2              ;START COUNT PATTERN AT 0
2440  011552  012737  011560  001110          MOV     #1$,$LPERR      ;START COUNT PATTERN AT 0
2441  011560  000240                  1$:     NOP                     ;SET LOOP ON ERROR POINTER TO 1$
2442  011562  010237  170200                  MOV     R2,MAPL00       ;THIS IS A SYNC POINT FOR SCOPING
2443  011566  013700  170200                  MOV     MAPL00,R0       ;LOAD MAP REG 0 LOW 16 BITS
2444  011572  020200                          CMP     R2,R0           ;READ CONTENTS OF MAP REGISTER 0
2445  011574  001402                          BEQ     2$              ;COMPARE DATA & PATTERN
2446  011576  104012                          ERROR   12              ;BRANCH IF DATA DOES NOT MATCH
2447  011600  000404                          BR      3$              ;POSSIBLE DATA PATH FAILURE
2448                                                                  ;BRANCH TO TEST DATA PATH WITH
2449  011602  062702  000002          2$:     ADD     #2,R2           ;A REGISTER OF THE NEXT GROUP
2450  011606  001364                          BNE     1$              ;ADD 2 TO COUNT PATTERN
2451  011610  000416                          BR      10$             ;BRANCH IF COUNT NOT COMPLETE.
2452  011612  012737  011620  001110  3$:     MOV     #12$,$LPERR     ;DATA PATH OKAY FOR LOW 16 BITS
2453  011620  000240                  12$:    NOP                     ;SET LOOP ON ERROR POINTER TO 12$
2454  011622  010337  170300                  MOV     R3,MAPL20       ;THIS IS A SYNC POINT FOR SCOPING
2455  011626  013701  170300                  MOV     MAPL20,R1       ;LOAD MAP REG 20 LOW 16 BITS
2456  011632  020301                          CMP     R3,R1           ;READ DATA STORED IN MAP REGISTER 20
2457  011634  001003                          BNE     4$              ;COMPARE DATA & PATTERN
2458  011636  062703  000002                  ADD     #2,R3           ;CAUGHT ERROR,NOW SEE IF SAME.
2459  011642  001357                          BNE     2$              ;ADD 2 TO COUNT PATTERN
2460  011644  104013                  4$:     ERROR   13              ;BRANCH IF COUNT NOT 0
2461  011646  012737  011546  001110  10$:    MOV     #20$,$LPERR     ;PROBABLY IS A REAL DATA PATH ERROR
2462                                                                  ;SET LOOP POINTER TO START OF TEST
2463
2464                                  ;;**********************************************************************
2465                                  ;*TEST 10       DATA PATH TEST TO MAP REGISTER UPPER 6 BITS
2466                                  ;*
2467                                  ;*      THIS TEST WILL ENSURE THAT THE DATA PATH TO AND FROM THE UNIBUS
2468                                  ;*      MAP REGISTERS IS FUNCTIONING PROPERLY.  IT RUNS A COUNT PATTERN
2469                                  ;*      THROUGH MAPH00, AND IF IT DETECTS AN ERROR THE EXPECTED COUNT
2470                                  ;*      AND THE RECEIVED COUNT ARE REPORTED.  THE TEST THEN TRIES TO RUN
2471                                  ;*      THE COUNT THROUGH MAPH20, IN CASE THE ERROR IS IN THE LOWER
2472                                  ;*      GROUP OF REGISTERS AND NOT IN THE DATA PATH.
2473                                  ;*      THE DATA INPUT TO THE MAP REGISTERS IS RECEIVED FROM THE UNIBUS
2474                                  ;*      ON 'MAPA' AND THE OUTPUT TO THE UNIBUS IS DRIVEN ON 'MAPJ'.
2475                                  ;*
2476                                  ;;**********************************************************************
2477  011654                          TST10:
2478  011654  000004                          SCOPE
2479  011656  012737  012054  001324          MOV     #TST11,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2480                                                                  ;FOR ESCAPE ON PARITY ERRORS
2481  011664  012737  000002  001204          MOV     #2,$TIMES       ;;DO 2 ITERATIONS
2482  011672  005002                  20$:     CLR     R2              ;START COUNT PATTERN AT 0
2483  011674  005003                          CLR     R3              ;START COUNT PATTERN AT 0
2484  011676  005004                          CLR     R4              ;START COUNT AT ZERO
2485  011700  105737  001331                  TSTB    KB11EM          ;IS THIS A KB11-EM?
2486  011704  001003                          BNE     55$             ;BR IF IT IS
2487  011706  105737  001332                  TSTB    KB11CM          ;IS THIS A MODIFIED PROCESSOR?
2488  011712  001403                          BEQ     56$             ;NO,CARRY ON
2489  011714  012737  012052  012046  55$:     MOV     #72$+4,72$ ;USE THE MODIFIED MASK
2490  011722  012737  011730  001110  56$:     MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
2491  011730  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
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```
2492  011732  010402                        MOV     R4,R2           ;MOVE COUNT TO R2
2493  011734  010237  170202                MOV     R2,@#MAPH0      ;LOAD MAP REG0 HIGH 6 BITS
2494  011740  013700  170202                MOV     MAPH00,R0       ;READ BACK MAP REG 00 UPPER SIX BITS
2495  011744  047702  000076                BIC     @72$,R2 ;       ;MASK OUT UNUSED BITS
2496  011750  020200                        CMP     R2,R0           ;COMPARE DATA AND PATTERN LOADED
2497  011752  001402                        BEQ     2$              ;BRANCH IF DATA IS CORRECT
2498  011754  104012                        ERROR   12              ;POSSIBLE DATA PATH ERROR
2499  011756  000405                        BR      3$              ;BRANCH TO TRY SECOND BANK OF MAP REGS
2500  011760  005204                2$:     INC     R4              ;CHANGE DATA PATTERN
2501  011762  022704  177777                CMP     #177777,R4      ;HAS COUNT REACH MAXIMUM?
2502  011766  001360                        BNE     1$              ;BRANCH IF TEST NOT OVER
2503  011770  000422                        BR      10$             ;UPPER SIX BIT DATA PATH IS OKAY
2504  011772  012737  012000  001110  3$:   MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
2505  012000  000240                12$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2506  012002  010403                        MOV     R4,R3
2507  012004  010337  170302                MOV     R3,@#MAPH20     ;LOAD MAP REG 20 HIGH 6 BITS
2508  012010  013701  170302                MOV     MAPH20,R1       ;READ BACK MAP REG 20 UPPER SIX BITS
2509  012014  047703  000026                BIC     @72$,R3
2510  012020  020301                        CMP     R3,R1           ;COMPARE DATA AND PATTERN
2511  012022  001004                        BNE     4$              ;BRANCH IF DATA DOES NOT MATCH
2512  012024  005204                        INC     R4              ;CHANGE DATA PATTERN
2513  012026  022704  177777                CMP     #177777,R4      ;HAS COUNT REACHED MAXIMUM?
2514  012032  001352                        BNE     2$              ;BRANCH IF TEST NOT OVER
2515  012034  104013                4$:     ERROR   13              ;PROBABLY IS A REAL DATA PATH ERROR
2516  012036  012737  011672  001110  10$:   MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
2517  012044  000403                        BR      72$+6
2518  012046  012050                72$:    .WORD   72$+2           ;POINTER TO PROPER MASK
2519  012050  177700                        .WORD   177700          ;NONMODIFIED PROCESSORS USE THIS
2520  012052  077700                        .WORD   077700          ;MODIFIED PROCESSORS USE THIS
2521
2522                                ;;*****************************************************************
2523                                ;*TEST 11       DUAL ADDRESSING ON LOADING AND READING MAP REGISTERS
2524                                ;*
2525                                ;*      THIS TEST ENSURES THAT ONLY ONE UNIBUS MAP REGISTER IS LOADED
2526                                ;*      DURING A 'MOV   #DATA,@#MAPREG' INSTRUCTION.  ALL MAP REGISTERS
2527                                ;*      ARE CLEARED AND ONE REGISTER AT A TIME, STARTING WITH MAPL00,
2528                                ;*      IS LOADED A NEGATIVE ONE.  THEN, ALL MAP REGISTERS ARE READ,
2529                                ;*      STARTING WITH MAPH37, AND VERIFIED TO BE ZERO.  ANY REGISTER
2530                                ;*      THAT IS NOT ZERO AND WHOSE UNIBUS ADDRESS DOES NOT MATCH THAT
2531                                ;*      OF THE REGISTER UNDER TEST IS REPORTED TO BE IN ERROR.  AT THE
2532                                ;*      END OF THE TEST A SUMMARY OF ALL DUALED REGISTERS IS GIVEN.
2533                                ;*      THE SIGNALS THAT ARE TESTED HERE ARE ON 'MAPC' AND ARE:
2534                                ;*      'EN LOREG' & 'EN HIREG'.  THE 'A' INPUTS TO THE ADDRESS
2535                                ;*      MULTIPLEXER SHOULD BE THE ONES IN USE DURING A READ OR WRITE
2536                                ;*      TO THE UNIBUS MAP REGISTERS.
2537                                ;*
2538                                ;*****************************************************************
2539  012054                        TST11:
2540  012054  000004                        SCOPE
2541  012056  012737  012200  001324        MOV     #TST12,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2542                                                                ;FOR ESCAPE ON PARITY ERRORS
2543  012064  012737  000144  001204        MOV     #144,$TIMES     ;;DO 144 ITERATIONS
2544  012072  012700  170200        20$:    MOV     #MAPL0,R0       ;LOAD FIRST MAP REG ADDR INTO R0
2545  012076  012737  012104  001110        MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER HERE
2546  012104  012701  170376        1$:     MOV     #MAPH37,R1      ;PUT ADDRESS OF HIGHEST MAP REG IN R1
2547  012110  004737  005134                JSR     PC,CLRMAP       ;CLEAR ALL MAP REGISTERS IN CASE OF
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2548
2549  012114  000240                          NOP             ;A 'FLAKEY' PROBLEM
                                                              ;THIS IS A SYNC POINT FOR SCOPING
2550  012116  012710  177777                  MOV     #177777,(R0)    ;LOAD MAP REGISTER UNDER TEST
2551  012122  011102                  2$:     MOV     (R1),R2         ;READ MAP REGS STARTING FROM TOP
2552  012124  001404                          BEQ     3$              ;GO TO 3$ IF ZERO
2553  012126  020100                          CMP     R1,R0           ;SEE IF NON-ZERO ADDRS MATCH
2554  012130  001402                          BEQ     3$              ;GO TO 3$ IF MATCH
2555  012132  004737  005356                  JSR     PC,DUALADR      ;JUMP TO SUBROUTINE TO LOG ALL ERRORS
2556  012136  162701  000002          3$:     SUB     #2,R1           ;POINT TO NEXT MAP REGISTER
2557  012142  022701  170200                  CMP     #MAPL0,R1       ;HAVE ALL REGISTERS BEEN READ
2558  012146  101765                          BLOS    2$              ;IF NOT CONTINUE TEST
2559  012150  062700  000002                  ADD     #2,R0           ;POINT TO NEXT MAP REGISTER
2560  012154  022700  170376                  CMP     #MAPH37,R0      ;SEE IF TEST IS OVER
2561  012160  103351                          BHIS    1$              ;CONTINUE TESTING
2562  012162  012737  012072  001110          MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
                                                              ;OF INTERMITTENT FAULTS.
2563
2564  012170  005737  001254                  TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2565  012174  001401                          BEQ     TST12           ;;GOTO NEXT TEST IF NO ERRORS
2566  012176  104014                          ERROR   14              ;SUMMARY OF DUAL ADDRESSING ERRORS
                                                              ;ON LOADING MAP REGISTERS
2567
2568
2569
2570                                  ;*THE NEXT FOUR(4) TESTS RUN A COUNT PATTERN THROUGH EACH
2571                                  ;*MAP REGISTER, CHECKING FOR STUCK BITS, AND SHORTED PINS.
2572
2573                                  ;;*****************************************************************
2574                                  ;*TEST 12       COUNT PATTERN LOW 20 MAP REGISTERS LOWER 16 BITS
2575                                  ;*
2576                                  ;*      THIS TEST WILL RUN A COUNT PATTERN THROUGH UNIBUS MAP REGISTERS
2577                                  ;*      MAPL00 - MAPL17.  IF THE COUNT RECIEVED DOES NOT MATCH THE
2578                                  ;*      EXPECTED PATTERN THEN THE MAP REGISTER ADDRESS, DATA RECEIVED,
2579                                  ;*      PATTERN LOADED, AND PATTERN EXPECTED ARE REPORTED.  AT THE END
2580                                  ;*      OF THE TEST A SUMMARY OF ALL ERRORS IS GIVEN SO THAT YOU CAN
2581                                  ;*      DETERMINE IF THE ERROR IS BIT SENSITIVE OR REGISTER SENSITIVE.
2582                                  ;*      THE REGISTERS ARE ON 'MAPC' AND THE OUTPUT MULTIPLEXER IS ON
2583                                  ;*      'MAPJ'.
2584                                  ;;*****************************************************************
2585  012200                          TST12:
2586  012200  000004                          SCOPE
2587  012202  012737  012324  001324          MOV     #TST13,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2588                                                              ;FOR ESCAPE ON PARITY ERRORS
2589  012210  012737  000012  001204          MOV     #12,$TIMES      ;;DO 12 ITERATIONS
2590  012216  005002                  20$:     CLR     R2              ;START WITH AN ALL ZERO PATTERN
2591  012220  012737  012240  001110          MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
2592  012226  010204                  1$:     MOV     R2,R4           ;PUT COUNT IN R4 FOR MASK
2593  012230  042704  000001                  BIC     #000001,R4      ;CLEAR BITS IN MASK FOR PROPER COMPARE
2594  012234  012700  170200                  MOV     #MAPL00,R0      ;LOAD STARTING MAP REGISTER ADDRESS
2595  012240  000240                  2$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2596  012242  010210                          MOV     R2,(R0)         ;LOAD MAP REGISTER WITH COUNT PATTERN
2597  012244  011003                          MOV     (R0),R3         ;READ MAP REGISTER INTO R3
2598  012246  020403                          CMP     R4,R3           ;COMPARE MASK WITH DATA
2599  012250  001402                          BEQ     3$              ;BRANCH IF DATA MATCHES
2600  012252  004737  005432                  JSR     PC,COUNT        ;JUMP TO COUNT TO LOG ALL ERRORS
2601  012256  005003                  3$:     CLR     R3              ;CLEAR DATA HOLDER
2602  012260  062700  000004                  ADD     #4,R0           ;POINT TO NEXT MAP REGISTER UNDER TEST
2603  012264  022700  170274                  CMP     #MAPL17,R0      ;SEE IF ALL REGISTERS HAVE BEEN LOADED
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```
2604  012270  103363                          BHIS    2$              ;BRANCH IF STILL MORE TO GO
2605  012272  022702  177777                  CMP     #177777,R2      ;SEE IF COUNT HAS CYCLED
2606  012276  001403                          BEQ     4$              ;BRANCH IF TEST IS DONE
2607  012300  062702  000401                  ADD     #401,R2         ;CHANGE COUNT PATTERN
2608  012304  000750                          BR      1$              ;CONTINUE TESTING
2609  012306  012737  012216  001110  4$:     MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
2610                                                                  ;OF INTERMITTENT FAULTS.
2611  012314  005737  001254                  TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2612  012320  001401                          BEQ     TST13           ;;BRANCH IF NO ERRORS
2613  012322  104000                          ERROR                   ;SUMMARY OF COUNT PATTERN FAILURES
2614                                                                  ;IN MAPPING REGISTERS
2615
2616
2617                                  ;;**********************************************************************
2618                                  ;*TEST 13       COUNT PATTERN LOW 20 MAP REGISTERS UPPER 6 BITS
2619                                  ;*
2620                                  ;*      THIS TEST WILL RUN A COUNT PATTERN THROUGH UNIBUS MAP REGISTERS
2621                                  ;*      MAPH00 - MAPH17.  IF THE COUNT RECIEVED DOES NOT MATCH THE
2622                                  ;*      EXPECTED PATTERN THEN THE MAP REGISTER ADDRESS, DATA RECEIVED,
2623                                  ;*      PATTERN LOADED, AND PATTERN EXPECTED ARE REPORTED.  AT THE END
2624                                  ;*      OF THE TEST A SUMMARY OF ALL ERRORS IS GIVEN SO THAT YOU CAN
2625                                  ;*      DETERMINE IF THE ERROR IS BIT SENSITIVE OR REGISTER SENSITIVE.
2626                                  ;*      THE REGISTERS ARE ON 'MAPC' AND THE OUTPUT MULTIPLEXER IS ON
2627                                  ;*      'MAPJ'.
2628                                  ;;**********************************************************************
2629  012324                          TST13:
2630  012324  000004                          SCOPE
2631  012326  012737  012450  001324          MOV     #TST14,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2632                                                                  ;FOR ESCAPE ON PARITY ERRORS
2633  012334  012737  000144  001204          MOV     #144,$TIMES     ;;DO 144 ITERATIONS
2634  012342  005002                  20$:     CLR     R2              ;START WITH AN ALL ZERO PATTERN
2635  012344  012737  012364  001110          MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
2636  012352  010204                  1$:      MOV     R2,R4           ;PUT COUNT IN R4 FOR MASK
2637  012354  042704  177700                  BIC     #177700,R4      ;CLEAR BITS IN MASK FOR PROPER COMPARE
2638  012360  012700  170202                  MOV     #MAPH00,R0      ;LOAD STARTING MAP REGISTER ADDRESS
2639  012364  000240                  2$:      NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2640  012366  010210                          MOV     R2,(R0)         ;LOAD MAP REGISTER WITH COUNT PATTERN
2641  012370  011003                          MOV     (R0),R3         ;READ MAP REGISTER INTO R3
2642  012372  020403                          CMP     R4,R3           ;COMPARE MASK WITH DATA
2643  012374  001402                          BEQ     3$              ;BRANCH IF DATA MATCHES
2644  012376  004737  005432                  JSR     PC,COUNT        ;JUMP TO COUNT TO LOG ALL ERRORS
2645  012402  005003                  3$:      CLR     R3              ;CLEAR DATA HOLDER
2646  012404  062700  000004                  ADD     #4,R0           ;POINT TO NEXT MAP REGISTER UNDER TEST
2647  012410  022700  170276                  CMP     #MAPH17,R0      ;SEE IF ALL REGISTERS HAVE BEEN LOADED
2648  012414  103363                          BHIS    2$              ;BRANCH IF STILL MORE TO GO
2649  012416  022702  000177                  CMP     #177,R2 ;SEE IF COUNT HAS CYCLED
2650  012422  001403                          BEQ     4$              ;BRANCH IF TEST IS DONE
2651  012424  062702  000001                  ADD     #1,R2           ;CHANGE COUNT PATTERN
2652  012430  000750                          BR      1$              ;CONTINUE TESTING
2653  012432  012737  012342  001110  4$:     MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
2654                                                                  ;OF INTERMITTENT FAULTS.
2655  012440  005737  001254                  TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2656  012444  001401                          BEQ     TST14           ;;BRANCH IF NO ERRORS
2657  012446  104016                          ERROR   16              ;SUMMARY OF COUNT PATTERN FAILURES
2658                                                                  ;IN MAPPING REGISTERS
2659
```

```
                                ;;*****************************************************************
                                ;*TEST 14       COUNT PATTERN HIGH 20 MAP REGISTERS LOWER 16 BITS
                                ;*
                                ;*      THIS TEST WILL RUN A COUNT PATTERN THROUGH UNIBUS MAP REGISTERS
                                ;*      MAPL20 - MAPL37.  IF THE COUNT RECIEVED DOES NOT MATCH THE
                                ;*      EXPECTED PATTERN THEN THE MAP REGISTER ADDRESS, DATA RECEIVED,
                                ;*      PATTERN LOADED, AND PATTERN EXPECTED ARE REPORTED.  AT THE END
                                ;*      OF THE TEST A SUMMARY OF ALL ERRORS IS GIVEN SO THAT YOU CAN
                                ;*      DETERMINE IF THE ERROR IS BIT SENSITIVE OR REGISTER SENSITIVE.
                                ;*      THE REGISTERS ARE ON 'MAPD' AND THE OUTPUT MULTIPLEXER IS ON
                                ;*      'MAPJ'.
                                ;;*****************************************************************
012450                          TST14:
                                        SCOPE
012450  000004
012452  012737  012574  001324         MOV     #TST15,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
012460  012737  000012  001204         MOV     #12,$TIMES      ;;DO 12 ITERATIONS
012466  005002                 20$:    CLR     R2              ;START WITH AN ALL ZERO PATTERN
012470  012737  012510  001110         MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
012476  010204                 1$:     MOV     R2,R4           ;PUT COUNT IN R4 FOR MASK
012500  042704  000001                 BIC     #000001,R4      ;CLEAR BITS IN MASK FOR PROPER COMPARE
012504  012700  170300                 MOV     #MAPL20,R0      ;LOAD STARTING MAP REGISTER ADDRESS
012510  000240                 2$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
012512  010210                         MOV     R2,(R0)         ;LOAD MAP REGISTER WITH COUNT PATTERN
012514  011003                         MOV     (R0),R3         ;READ MAP REGISTER INTO R3
012516  020403                         CMP     R4,R3           ;COMPARE MASK WITH DATA
012520  001402                         BEQ     3$              ;BRANCH IF DATA MATCHES
012522  004737  005432                 JSR     PC,COUNT        ;JUMP TO COUNT TO LOG ALL ERRORS
012526  005003                 3$:     CLR     R3              ;CLEAR DATA HOLDER
012530  062700  000004                 ADD     #4,R0           ;POINT TO NEXT MAP REGISTER UNDER TEST
012534  022700  170374                 CMP     #MAPL37,R0      ;SEE IF ALL REGISTERS HAVE BEEN LOADED
012540  103363                         BHIS    2$              ;BRANCH IF STILL MORE TO GO
012542  022702  177777                 CMP     #177777,R2      ;SEE IF COUNT HAS CYCLED
012546  001403                         BEQ     4$              ;BRANCH IF TEST IS DONE
012550  062702  000401                 ADD     #401,R2         ;CHANGE COUNT PATTERN
012554  000750                         BR      1$              ;CONTINUE TESTING
012556  012737  012466  001110 4$:     MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
                                                                ;OF INTERMITTENT FAULTS.
012564  005737  001254                 TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
012570  001401                         BEQ     TST15           ;;BRANCH IF NO ERRORS
012572  104015                         ERROR   15              ;SUMMARY OF COUNT PATTERN FAILURES
                                                                ;IN MAPPING REGISTERS


                                ;;*****************************************************************
                                ;*TEST 15       COUNT PATTERN HIGH 20 MAP REGISTERS UPPER 6 BITS
                                ;*
                                ;*      THIS TEST WILL RUN A COUNT PATTERN THROUGH UNIBUS MAP REGISTERS
                                ;*      MAPH20 - MAPH37.  IF THE COUNT RECIEVED DOES NOT MATCH THE
                                ;*      EXPECTED PATTERN THEN THE MAP REGISTER ADDRESS, DATA RECEIVED,
                                ;*      PATTERN LOADED, AND PATTERN EXPECTED ARE REPORTED.  AT THE END
                                ;*      OF THE TEST A SUMMARY OF ALL ERRORS IS GIVEN SO THAT YOU CAN
                                ;*      DETERMINE IF THE ERROR IS BIT SENSITIVE OR REGISTER SENSITIVE.
                                ;*      THE REGISTERS ARE ON 'MAPD' AND THE OUTPUT MULTIPLEXER IS ON
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2716                                    ;*      'MAPJ'.
2717                                    ;;*****************************************************************
2718  012574                            TST15:
2719  012574  000004                            SCOPE
2720  012576  012737  012720  001324            MOV     #TST16,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2721                                                                    ;FOR ESCAPE ON PARITY ERRORS
2722  012604  012737  000144  001204            MOV     #144,$TIMES     ;;DO 144 ITERATIONS
2723  012612  005002                    20$:     CLR     R2              ;START WITH AN ALL ZERO PATTERN
2724  012614  012737  012634  001110            MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
2725  012622  010204                    1$:      MOV     R2,R4           ;PUT COUNT IN R4 FOR MASK
2726  012624  042704  177700                    BIC     #177700,R4      ;CLEAR BITS IN MASK FOR PROPER COMPARE
2727  012630  012700  170302                    MOV     #MAPH20,R0      ;LOAD STARTING MAP REGISTER ADDRESS
2728  012634  000240                    2$:      NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2729  012636  010210                            MOV     R2,(R0)         ;LOAD MAP REGISTER WITH COUNT PATTERN
2730  012640  011003                            MOV     (R0),R3         ;READ MAP REGISTER INTO R3
2731  012642  020403                            CMP     R4,R3           ;COMPARE MASK WITH DATA
2732  012644  001402                            BEQ     3$              ;BRANCH IF DATA MATCHES
2733  012646  004737  005432                    JSR     PC,COUNT        ;JUMP TO COUNT TO LOG ALL ERRORS
2734  012652  005003                    3$:      CLR     R3              ;CLEAR DATA HOLDER
2735  012654  062700  000004                    ADD     #4,R0           ;POINT TO NEXT MAP REGISTER UNDER TEST
2736  012660  022700  170376                    CMP     #MAPH37,R0      ;SEE IF ALL REGISTERS HAVE BEEN LOADED
2737  012664  103363                            BHIS    2$              ;BRANCH IF STILL MORE TO GO
2738  012666  022702  000177                    CMP     #177,R2 ;SEE IF COUNT HAS CYCLED
2739  012672  001403                            BEQ     4$              ;BRANCH IF TEST IS DONE
2740  012674  062702  000001                    ADD     #1,R2           ;CHANGE COUNT PATTERN
2741  012700  000750                            BR      1$              ;CONTINUE TESTING
2742  012702  012737  012612  001110    4$:     MOV     #20$,$LPERR     ;INITIALIZE LOOPING POINTER IN CASE
2743                                                                    ;OF INTERMITTENT FAULTS.
2744  012710  005737  001254                    TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
2745  012714  001401                            BEQ     TST16           ;;BRANCH IF NO ERRORS
2746  012716  104016                            ERROR   16              ;SUMMARY OF COUNT PATTERN FAILURES
2747                                                                    ;IN MAPPING REGISTERS
2748
2749
2750                                    ;;*****************************************************************
2751                                    ;*TEST 16       CACHE REGISTER DATA PATHS
2752                                    ;*
2753                                    ;*      THIS TEST MAKES AN EFFORT TO VERIFY THE DATA PATH FROM THE
2754                                    ;*      CACHE REGISTERS THROUGH THE UNIBUS MAP TO THE CPU.  IT FIRST
2755                                    ;*      CHECKS THE CONTROL REGISTER (177746) TO SEE IF THE CACHE IS
2756                                    ;*      DISABLED, IF IT IS NOT DISABLED THEN THE CONTROL REGISTER
2757                                    ;*      IS CLEARED AND VERIFIED TO BE ZERO.  THE MAINTENENCE REGISTER
2758                                    ;*      IS ALWAYS CLEARED AND VERIFIED TO BE ZERO.  THEN THE CACHE
2759                                    ;*      ADDRESS REGISTERS (177740 & 177742) ARE READ, WITH THE ERROR
2760                                    ;*      REGISTER CLEARED.  THEY SHOULD BE 177740 AND 000003 RESPECTIVELY.
2761                                    ;*      IF ANY OF THESE CONDITIONS ARE NOT MET AN ERROR IS REPORTED
2762                                    ;*      AS BEING A POSSIBLE CACHE REGISTER DATA PATH ERROR.
2763                                    ;*      THE INPUT TO THE CACHE REGISTERS IS FROM 'MAPA' AND THE CACHE
2764                                    ;*      DATA MULTIPLEXER IS ON 'MAPH'.  THE REGISTER INPUTS ARE THE
2765                                    ;*      'X'' INPPUTS, THESE GO TO 'MAPJ' TO GET BACK TO THE CPU.
2766                                    ;*
2767                                    ;;*****************************************************************
2768  012720                            TST16:
2769  012720  000004                            SCOPE
2770  012722  012737  013116  001324            MOV     #TST17,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2771                                                                    ;FOR ESCAPE ON PARITY ERRORS
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2772  012730  012737  012750  001110  20$:    MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
2773  012736  005000                           CLR     R0              ;CLEAR R0 IN CASE CACHE IS DISABLED
2774  012740  032737  000014  177746           BIT     #14,@#CONTRL    ;SEE IF EITHER GROUP IS DISABLED
2775  012746  001012                           BNE     1$              ;BRANCH IF CACHE IS DISABLED
2776  012750  000240                  10$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2777  012752  005005                           CLR     R5
2778  012754  005037  177746                   CLR     @#CONTRL        ;CLEAR CONTROL REGISTER
2779  012760  013700  177746           21$:    MOV     @#CONTRL,R0     ;READ CONTROL REGISTER
2780  012764  001403                           BEQ     1$              ;BRANCH IF CONTROL REGISTER IS ZERO
2781  012766  005205                           INC     R5              ;WAIT FOR VCIP BIT IN CCR TO
2782  012770  001373                           BNE     21$             ;CLEAR
2783  012772  104017                           ERROR   17              ;POSSIBLE FAULT IN CACHE REG DATA PATHS
2784  012774  012737  013002  001110  1$:     MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
2785  013002  000240                  11$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2786  013004  005037  177750                   CLR     @#MAINT         ;CLEAR MAINTENENCE REGISTER
2787  013010  013701  177750                   MOV     @#MAINT,R1      ;READ MAINTENENCE REGISTER
2788  013014  001401                           BEQ     2$              ;BRANCH IF MAINTENENCE REGISTER IS ZERO
2789  013016  104020                           ERROR   20              ;MAINTENENCE REGISTERWILL NOT CLEAR
2790  013020  012737  013026  001110  2$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
2791  013026  012737  177777  177744  12$:    MOV     #-1,MEMERR      ;MAKE SURE THAT CACHE ERROR REG IS CLEAR
2792  013034  000240                           NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2793  013036  013700  177740                   MOV     LOADRS,R0       ;READ CACHE LOW ADDR REG TO R0
2794  013042  022700  177740                   CMP     #177740,R0      ;SEE IF R0 = ADDR OF CACHE LOW ADDR REG
2795  013046  001401                           BEQ     3$              ;BRANCH IF DATA READ CORRECTLY
2796  013050  104021                           ERROR   21              ;CANNOT READ 177740 FROM 'LOADRS''
2797  013052  012737  013060  001110  3$:     MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
2798  013060  012737  177777  177744  13$:    MOV     #-1,MEMERR      ;MAKE SURE THAT CACHE ERROR REG IS CLEAR
2799  013066  000240                           NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2800  013070  013700  177742                   MOV     HIADRS,R0       ;READ CACHE HIGH ADDR REG TO R0
2801  013074  042700  177700                   BIC     #177700,R0      ;MASK OFF UPPER  10 BITS
2802  013100  022700  000003                   CMP     #3,R0           ;SEE IF R0 = 3
2803  013104  001401                           BEQ     14$             ;BRANCH IF DATA MATCHES
2804  013106  104022                           ERROR   22              ;CANNOT READ 000003 FROM 'HIADRS''
2805  013110  012737  012730  001110  14$:    MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
2806
2807
2808                                    ;;*******************************************************************
2809                                    ;*TEST 17       CACHE REGISTER DATA PATH COUNT PATTERN
2810                                    ;*
2811                                    ;*      THIS TEST FIRST SAVES THE CONDITION OF THE CACHE CONTROL
2812                                    ;*      REGISTER IS '$TMP5'' SO THAT THE CACHE CAN BE RESTORED.
2813                                    ;*      IF EITHER BIT 3 OR 4 IS ON THE TEST BRANCHES TO '3$'' TO
2814                                    ;*      TEST BITS 5 - 15 OF THE DATA PATH, IF NEITHER BIT IS ON THEN
2815                                    ;*      THE TEST RUNS A COUNT PATTERN THRU THE CONTROL REGISTER FROM
2816                                    ;*      00 - 77.   IF ANY BITS ARE DETECTED AS BEING STUCK THE ERROR
2817                                    ;*      IS REPORTED AND A SUMMARY OF THOSE ERRORS IS GIVEN.  THEN THE
2818                                    ;*      TEST FORCES MISSES IN BOTH GROUPS OF THE CACHE AND PROCEEDS
2819                                    ;*      TO RUN A COUNT PATTERN THROUGH THE CACHE MAINTENENCE REGISTER
2820                                    ;*      (177746) FROM 000000 - 177760 IN INCREMENTS OF 20.
2821                                    ;*      THE CODE IS SET UP IN SUCH A WAY THAT NO PARITY ERRORS
2822                                    ;*      SHOULD BE GENERATED.  AGAIN ALL BAD MATCHES OF DATA WILL BE
2823                                    ;*      REPORTED AND A SUMMARY OF ALL ERRORS IS GIVEN AT THE END OF
2824                                    ;*      THE TEST AND THE CACHE IS RESTORED TO ITS PREVIOUS CONDITION.
2825                                    ;*
2826                                    ;;*******************************************************************
2827  013116                            TST17:
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```
2828  013116  000004                        SCOPE
2829  013120  012737  013540  001324        MOV     #TST20,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
2830                                                                  ;FOR ESCAPE ON PARITY ERRORS
2831  013126  012737  000012  001204        MOV     #12,$TIMES      ;;DO 12 ITERATIONS
2832  013134  104416                        TBITO                   ;TURN OFF T BIT TRAPPING IF ON
2833  013136  013737  177746  001202  20$:  MOV     @#CONTRL,$TMP5  ;SAVE CONTROL REG TO RESTORE CACHE
2834  013144  032737  000014  177746        BIT     #14,@#CONTRL    ;SEE IF EITHER GROUP IS DISABLED
2835  013152  001047                        BNE     3$              ;SKIP FIRST PART OF TEST IF DISABLED
2836  013154  012700  177746                MOV     #CONTRL,R0      ;LOAD ADDR OF CONTROL REG INTO R0
2837  013160  005002                        CLR     R2              ;START COUNT PATTERN AT ZERO
2838  013162  012737  013170  001110        MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
2839  013170  000240                1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2840  013172  010210                        MOV     R2,(R0)         ;LOAD COUNT INTO CONTROL REG
2841  013174  011003                        MOV     (R0),R3         ;READ COUNT FROM CONTROL REG
2842  013176  020203                        CMP     R2,R3           ;SEE IF COUNT = DATA READ
2843  013200  001402                        BEQ     2$              ;BRANCH IF DATA MATCHES
2844  013202  004737  005576                JSR     PC,CACOUNT      ;LOG AND REPORT COUNT PATTERN ERROR
2845  013206  005202                2$:     INC     R2              ;CHANGE COUNT PATTERN
2846  013210  022702  000077                CMP     #77,R2          ;SEE IF COUNT HAS PASSED MAXIMUM
2847  013214  103365                        BHIS    1$              ;BRANCH IF COUNT HASN'T CYCLED
2848  013216  005737  001254                TST     ERRCNT          ;SEE IF ANY ERRORS ON THIS CYCLE
2849  013222  001423                        BEQ     3$              ;BRANCH IF NO ERRORS
2850  013224  104023                        ERROR   23              ;COUNT THRU CONTROL REG FAILED
2851  013226  005037  001322                CLR     RETRY           ;CLEAR RETRY FLAG AN THE START OF
2852                                                                  ;EACH TEST
2853  013232  005037  001254                CLR     ERRCNT          ;CLEAR THE MULTIPLE ERROR COUNTER
2854  013236  005037  001232                CLR     DATAOR          ;LOCATION FOR LOGICAL OR OF BAD DATA
2855  013242  005037  001226                CLR     ADDROR          ;LOCATION FOR LOGICAL OR OF ADDRESS
2856  013246  005037  001236                CLR     PATTOR          ;LOCATION FOR LOGICAL OR OF PATTERN LOADED
2857  013252  012700  177777                MOV     #-1,R0          ;LOAD -1 INTO R0 TO INITIALIZE LOGICAL AND LOCS
2858  013256  010037  001230                MOV     R0,DATAND       ;LOCATION FOR LOGICAL AND OF BAD DATA
2859  013262  010037  001224                MOV     R0,ADRAND       ;LOCATION FOR LOGICAL AND OF ADDRESS
2860  013266  010037  001234                MOV     R0,PATAND       ;LOCATION FOR LOGICAL AND OF PATTERN LOADED
2861  013272  012737  000014  177746  3$:   MOV     #14,@#CONTRL    ;DISABLE BOTH GROUPS OF CACHE
2862  013300  012700  177750                MOV     #MAINT,R0       ;LOAD ADDR OF MAINTENENCE REG INTO R0
2863  013304  010001                        MOV     R0,R1           ;R1 HAS #MAINT SO CLR (R1) HAS P.B.'S ON
2864  013306  005002                        CLR     R2              ;START COUNT PATTERN AT ZERO
2865  013310  012737  013316  001110        MOV     #4$,$LPERR      ;SET LOOP ON ERROR POINTER TO 4$
2866  013316  010205                4$:     MOV     R2,R5           ;PUT COUNT IN R5 FOR CORRECT PARITY
2867  013320  000240                        NOP                     ;THIS IS A SYNC POINT FOR SCOPING
2868  013322  010510                        MOV     R5,(R0)         ;LOAD MAINT REGISTER INST HAS P.B.'S ON
2869  013324  011003                        MOV     (R0),R3         ;READ MAINT REG (P.B.'S ON)
2870  013326  005011                        CLR     (R1)            ;TURN OFF MAINT REG (P.B.'S ON)
2871  013330  050000                        BIS     R0,R0           ;DUMMY INST WITH P.B.'S ON
2872  013332  020203                        CMP     R2,R3           ;SEE IF COUNT = DATA READ
2873  013334  001402                        BEQ     5$              ;BRANCH IF DATA MATCHES
2874  013336  004737  005576                JSR     PC,CACOUNT      ;LOG AND REPORT COUNT PATTERN ERROR
2875  013342  062702  000020                ADD     #20,R2          ;CHANGE COUNT PATTERN
2876  013346  001363                5$:     BNE     4$              ;BRANCH IF COUNT HAS NOT PASSED 177760
2877  013350  005737  001254                TST     ERRCNT          ;SEE IF ANY ERRORS ON THIS COUNT CYCLE
2878  013354  001401                        BEQ     19$             ;BRANCH IF NO ERRORS ON THIS PART
2879  013356  104024                        ERROR   24              ;SUMMARY OF COUNT ERRORS IN MAINT REG
2880  013360  012737  013136  001110  19$:  MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
2881  013366  013737  001202  177746        MOV     $TMP5,@#CONTRL  ;RETURN CACHE TO PREVIOUS STATE
2882  013374  000004                        SCOPE                   ;
2883
```

```
                                ;*      AT THIS POINT 22-BIT RELOCATION FROM MEMORY MANAGEMENT
                                ;*      IS ENABLED, WITH THE KIPAR'S MAPPED TO PHYSICAL 0-24K.
                                ;*      KIPAR6 IS MAPPED TO THE UNIBUS (170000) AND
                                ;*      KIPAR7 IS MAPPED TO THE I/O PAGE (177600).

013376  104420                          TBITR                   ;RESTORE THE T BIT TO ITS CONDITION
                                                                ;BEFORE THE LAST TEST
013400  012700  077406                  MOV     #77406,R0       ;MAKE THE KERNEL I-SPACE PAGES ALL
                                                                ;4K, UPWARD EXPANDABLE, READ/WRITE
013404  010037  172300                  MOV     R0,KIPDR0       ;KERNEL I-SPACE PAGE 0
013410  010037  172302                  MOV     R0,KIPDR1       ;KERNEL I-SPACE PAGE 1
013414  010037  172304                  MOV     R0,KIPDR2       ;KERNEL I-SPACE PAGE 2
013420  010037  172306                  MOV     R0,KIPDR3       ;KERNEL I-SPACE PAGE 3
013424  010037  172310                  MOV     R0,KIPDR4       ;KERNEL I-SPACE PAGE 4
013430  010037  172312                  MOV     R0,KIPDR5       ;KERNEL I-SPACE PAGE 5
013434  010037  172314                  MOV     R0,KIPDR6       ;KERNEL I-SPACE PAGE 6
013440  010037  172316                  MOV     R0,KIPDR7       ;KERNEL I-SPACE PAGE 7
013444  012737  000000  172340          MOV     #000,KIPAR0     ;MAP TO PHYSICAL 0
013452  012737  000200  172342          MOV     #200,KIPAR1     ;MAP TO PHYSICAL 4K - 8K
013460  012737  000400  172344          MOV     #400,KIPAR2     ;MAP TO PHYSICAL 8K - 12K
013466  012737  000600  172346          MOV     #600,KIPAR3     ;MAP TO PHYSICAL 12K - 16K
013474  012737  001000  172350          MOV     #1000,KIPAR4    ;MAP TO PHYSICAL 16K - 20K
013502  012737  001200  172352          MOV     #1200,KIPAR5    ;MAP TO PHYSICAL 20K - 24K
013510  012737  170000  172354          MOV     #170000,KIPAR6  ;MAP TO UNIBUS
013516  012737  177600  172356          MOV     #177600,KIPAR7  ;MAP TO I/O PAGE
013524  012737  000001  177572          MOV     #BIT0,MMR0      ;ENABLE FULL 18-BIT MAPPING
013532  012737  000020  172516          MOV     #BIT4,MMR3      ;ENABLE 22-BIT MAPPING

                                ;;**********************************************************************
                                ;*TEST 20       MAP REGISTER ADDRESS DECODE TEST
                                ;*
                                ;*      THIS TEST TRIES TO VERIFY THAT NONE OF THE INPUTS TO THE ADDRESS
                                ;*      DECODER FOR THE UNIBUS MAP REGISTERS ON 'MAPB' IS STUCK TRUE.
                                ;*      KIPAR6 IS SETUP TO HOLD 177702 AND R4 HAS THE VIRTUAL ADDRESS
                                ;*      TO SELECT MAPL00, THRU KIPAR6.  THE TEST THEN CHANGES ONE BIT
                                ;*      AT A TIME IN PAR6 SO THAT IT SHOULD NEVER REFERENCE MAPL00.  IF
                                ;*      IT DOES AN ERROR IS REPORTED.
                                ;*
                                ;;**********************************************************************
013540                          TST20:
013540  000004                          SCOPE
013542  012737  013572  001106          MOV     #20$,$LPADR     ;SET LOOP ON TEST POINTER TO 20$
013550  012737  013572  001110          MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO 20$
013556  012737  000020  001102          MOV     #20,$TSTNM      ;SETUP TEST NUMBER AND CLR ERROR FLAG
013564  013737  001102  177570          MOV     $TSTNM,DISPLAY  ;DISPLAY TEST NUMBER FOR ALL TO SEE
                                        .EQUIV  BIT4,TIMOUT     ;BIT4 IS TIMEOUT BIT IN CPU ERROR REG
013572  012737  000020  001264  20$:     MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
013600  012737  013640  001110          MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
013606  012737  177702  172354          MOV     #177702,KIPAR6  ;PUT MAP REG 0 ADDR IN PAR6
013614  012702  175254                  MOV     #175254,R2      ;PATTERN FOR TESTING.
013620  010237  170200                  MOV     R2,@#MAPL0      ;LOAD MAP REGISTER 0
013624  012700  004000                  MOV     #BIT11,R0       ;SET BIT 11 TO FLOAT THRU PAR6
013630  012704  140000                  MOV     #140000,R4      ;VIRT.ADDR. TO SELECT PAR6
013634  074037  172354          1$:     XOR     R0,KIPAR6       ;CHANGE A BIT OF MAP REG 0'S ADDR
013640  000240                  10$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
013642  011401                          MOV     (R4),R1         ;READ LOCATION POINTED TO BY PAR6
```

```
                                        CMP     R2,R1           ;SEE IF DATA FETCHED MATCHES PATTERN
                                        BNE     3$              ;BRANCH IF NOT SAME
                                        MOV     #0,(R4)         ;TRY TO CLEAR THIS LOCATION
                                        TST     @#MAPLO         ;SEE IF MAP REG 0 GOT CLEARED
                                        BNE     2$              ;BRANCH IF MAP REG NOT ZERO
                                        ERROR   25              ;GOT TO MAPLO WITH ONE BIT
                                                                ;DIFFERENT IN ADDRESS FROM 770200
                                2$:     MOV     R1,(R4)         ;RELOAD THE LOCATION
                                3$:     XOR     R0,KIPAR6       ;RESTORE BIT TO ORIGINAL STATUS
                                        ASR     R0              ;RIGHT SHIFT ONE PLACE
                                        CMP     R0,#1           ;SEE IF TEST IS OVER
                                        BNE     1$              ;BRANCH TO CONTINUE TEST
                                        MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
                                        CLR     CPUEXP          ;ZERO EXPECTED CPU TRAP FLAG

                                ;;*******************************************************************
                                ;*TEST 21       CACHE REGISTER ADDRESS DECODE TEST
                                ;*
                                ;*      THIS TEST TRIES TO VERIFY THAT NONE OF THE INPUTS TO THE ADDRESS
                                ;*      DECODER FOR THE CACHE REGISTERS ON 'MAPB' IS STUCK TRUE.
                                ;*      KIPAR6 IS SETUP TO HOLD 177740 AND R4 HAS THE VIRTUAL ADDRESS
                                ;*      TO SELECT 'LOADRS', THRU KIPAR6.  THE TEST THEN CHANGES ONE BIT
                                ;*      AT A TIME IN PAR6 SO THAT IT SHOULD NEVER REFERENCE 'LOADRS'.
                                ;*      IF IT DOES AN ERROR IS REPORTED.
                                ;*
                                ;;*******************************************************************
013714                          TST21:
013714  000004                          SCOPE
013716  012737  014116  001324         MOV     #TST22,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
013724  012737  000020  001264  20$:    MOV     #TIMOUT,CPUEXP  ;EXPECTING UNIBUS TIMEOUT IN THIS TEST
013732  012737  013766  001110         MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
013740  012737  177777  172354         MOV     #177777,KIPAR6  ;PUT CACHE REG BASE IN PAR6
013746  012702  177740                 MOV     #177740,R2      ;PUT DATA PATTERN IN R2
013752  012700  000040                 MOV     #BIT5,R0        ;SET BIT 5 TO FLOAT THRU PAR6
013756  012704  140040                 MOV     #140040,R4      ;VIRT. ADDR. TO SELECT PAR6
013762  074037  172354          1$:    XOR     R0,KIPAR6       ;CHANGE A BIT OF CACHE REG'S ADDR
013766  000240                  10$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
013770  011401                          MOV     (R4),R1         ;TRY TO READ CACHE 'LOADRS' WITH
                                                                ;ONE BIT DIFFERENT THAN ADDR. 777740
013772  020201                          CMP     R2,R1           ;SEE IF YOU GOT CACHE 'LOADRS'
013774  001001                          BNE     2$              ;BRANCH TO CONTINUE TEST.
013776  104026                          ERROR   26              ;READ CACHE 'LOADRS' WITHOUT ADRS 777740
014000  074037  172354          2$:    XOR     R0,KIPAR6       ;RESTORE BIT TO ORIGINAL STATUS.
014004  006200                          ASR     R0              ;RIGHT SHIFT R0 1 PLACE
014006  001365                          BNE     1$              ;BRANCH IF NOT 0
014010  012737  014022  001110         MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
014016  012701  177700                 MOV     #177700,R1      ;PUT ADDRESS IN R1
014022  000240                  11$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
014024  011103                          MOV     (R1),R3         ;TRY TO READ 177700
014026  020203                          CMP     R2,R3           ;SEE IF YOU GET 177740
014030  001001                          BNE     3$              ;BRANCH IF YOU DON'T
014032  104027                          ERROR   27              ;READ CACHE 'LOADRS' WITHOUT ADRS 777740
014034  012737  014046  001110  3$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
014042  012701  177760                 MOV     #177760,R1      ;PUT ADDRESS IN R1
014046  000240                  12$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
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2996  014050  011103                        MOV     (R1),R3         ;TRY TO READ 177760
2997  014052  020203                        CMP     R2,R3           ;SEE IF YOU GET 177740
2998  014054  001001                        BNE     4$              ;BRANCH IF YOU DON'T
2999  014056  104027                        ERROR   27              ;READ CACHE 'LOADRS' WITHOUT ADRS 777740
3000  014060  012737  014072  001110  4$:   MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
3001  014066  012701  177754                MOV     #177754,R1      ;PUT ADDRESS IN R1
3002  014072  000240                 13$:   NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3003  014074  011103                        MOV     (R1),R3         ;TRY TO READ 177754
3004  014076  020203                        CMP     R2,R3           ;SEE IF YOU GET 177740
3005  014100  001001                        BNE     19$             ;BRANCH IF YOU DIDN'T READ ADDRS 177740
3006  014102  104027                        ERROR   27              ;READ CACHE 'LOADRS' WITHOUT ADRS 777740
3007  014104  012737  013724  001110  19$:  MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3008  014112  005037  001264                CLR     CPUEXP          ;ZERO EXPECTED CPU TRAP CONDITION
3009
3010
3011                                  ;;*****************************************************************
3012                                  ;*TEST 22       DATA PATH, UNIBUS TO MAIN MEMORY
3013                                  ;*
3014                                  ;*      THIS TEST RUNS A COUNT PATTERN THROUGH A MEMORY LOCATION VIA
3015                                  ;*      THE UNIBUS.  THE UNIBUS MAP IS LEFT OFF DURING THIS TEST SO
3016                                  ;*      THAT THE ADDRESS IS NOT RELOCATED.  THE TEST TRIES TO LOAD THE
3017                                  ;*      PATTERN INTO ADDRESS 040000 (8K) BUT IF THE MAP JUMPERS ARE
3018                                  ;*      SET NOT TO RESPOND TO THAT ADDRESS THE NEXT 4K IS TRIED UNTIL
3019                                  ;*      THE TEST GETS TO MAIN MEMORY FROM THE UNIBUS.  IF THIS TEST
3020                                  ;*      DETERMINES THAT IT CANNOT GET TO MAIN MEMORY FROM THE UNIBUS
3021                                  ;*      IT REPORTS THE FACT AND SKIPS THE NEXT TEST FOR VERIFICATION.
3022                                  ;*      THE DATA PATH TO MAIN MEMORY FROM THE UNIBUS IS ON 'MAPA' AND
3023                                  ;*      THE PATH FROM MAIN MEMORY TO THE UNIBUS IS FROM THE CACHE
3024                                  ;*      'DTML CDMX D00'' - 'DTML CDMX D15'' INTO 'MAPH' THE 'Z' INPUTS
3025                                  ;*      TO THE MULTIPLEXER AND THEN TO 'MAPJ' AND OUT TO THE UNIBUS.
3026                                  ;*
3027                                  ;;*****************************************************************
3028  014116                          TST22:
3029  014116  000004                        SCOPE
3030  014120  012737  014350  001324        MOV     #TST23,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3031                                                                 ;FOR ESCAPE ON PARITY ERRORS
3032  014126  012737  000012  001204        MOV     #12,$TIMES      ;;DO 12 ITERATIONS
3033  014134  004737  005134          20$:  JSR     PC,CLRMAP       ;CLEAR ALL MAP REGISTERS
3034  014140  012737  000020  001264        MOV     #TIMOUT,CPUEXP  ;TIMEOUTS MIGHT OCCUR IN THIS TEST.
3035  014146  012737  014154  001110        MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
3036  014154  012737  170400  172354  10$:  MOV     #170400,KIPAR6  ;START WITH ADDRESS 8K FROM UNIBUS
3037  014162  005037  001266          1$:   CLR     PCPUER          ;CLEAR ERROR CONDITION LOCATION
3038  014166  000240                        NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3039  014170  013700  140000                MOV     @#140000,R0     ;TRY TO READ ADDRESS POINTED TO BY PAR6
3040  014174  005737  001266                TST     PCPUER          ;SEE IF READ OF ADDRESS TIMED OUT
3041  014200  001412                        BEQ     2$              ;BRANCH IF REFERENCE WAS GOOD
3042  014202  062737  000200  172354  4$:   ADD     #200,KIPAR6     ;TRY NEXT 4K BLOCK OF MEMORY
3043  014210  022737  177600  172354        CMP     #177600,KIPAR6 ;SEE IF YOU'VE POINTED TO I/O PAGE
3044  014216  001361                        BNE     1$              ;BRANCH IF NOT
3045  014220  104030                        ERROR   30              ;NO UNIBUS ADDRESSES RESPOND
3046  014222  000137  014500                JMP     SIZEJ           ;JUMP TO SIZE JUMPER TEST
3047  014226  013737  172354  172352  2$:   MOV     KIPAR6,KIPAR5   ;PUT PAR6 INTO PAR5
3048  014234  042737  170000  172352        BIC     #170000,KIPAR5  ;MAKE PAR5 A NON UNIBUS ADDRESS
3049  014242  012737  173214  120000        MOV     #173214,@#120000 ;PUT RANDOM NUMBER INTO TEST LOCATION BY FAST BUS
3050  014250  013701  140000                MOV     @#140000,R1     ;READ TEST LOCATION VIA UNIBUS
3051  014254  022701  173214                CMP     #173214,R1      ;SEE IF DATA WAS READ PROPERLY
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                                        BEQ     3$              ;DATA OKAY NOW VERIFY DATA PATH
                                        CMP     R0,R1           ;SEE IF DATA CHANGED FROM FIRST READ
                                        BNE     3$              ;BRANCH IF DATA CHANGED
                                        BR      4$              ;TRY NEXT 4K BLOCK
                                3$:     CLR     R1              ;CLEAR REGISTER TO HOLD COUNT
                                        MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
                                        MOV     #140000,R2      ;LOAD VIRTUAL ADDRESS INTO R2
                                11$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
                                5$:     MOV     R1,(R2)         ;LOAD COUNT INTO TEST LOCATION VIA U.B.
                                        MOV     (R2),R0         ;READ TEST LOCATION BACK VIA UNIBUS
                                        CMP     R1,R0           ;COMPARE COUNT WITH DATA READ
                                        BEQ     6$              ;BRANCH IF DATA MATCHES
                                        JSR     PC,UBCOUNT      ;COUNT FAILED REPORT ERROR
                                6$:     INC     R1              ;INCREASE COUNT
                                        BNE     5$              ;BRANCH IF COUNT HASN'T CYCLED
                                        TST     ERRCNT          ;WERE THERE ANY ERRORS ON THIS TEST
                                        BEQ     19$             ;BRANCH IF NO ERRORS ON THIS TEST
                                        ERROR   31              ;SUMMARY OF ERRORS ON THE UNIBUS
                                                                ;DATA PATH
                                19$:    MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
                                        CLR     CPUEXP          ;ZERO EXPECTED CPU TRAP CONDITION

;;*****************************************************************
;*TEST 23        MAP DOESN'T RELOCATE IF NOT ENABLED
;*
;*      THIS TEST VERIFIES THAT THE UNIBUS MAP DOES NOT RELOCATE IF BIT5
;*      OF MMR3 IS NOT SET.  THE TEST ASSUMES THAT THE PREVIOUS TEST HAS
;*      RUN SUCCESSFULLY AND LEFT KIPAR6 POINTING TO THE FIRST UNIBUS
;*      MAPPING REGISTER THAT THE UNIBUS MAP WILL RESPOND TO GREATER
;*      THAN OR EQUAL TO MAPREG #2.  KIPAR5 IS ALSO POINTING TO THE
;*      SAME MEMORY BASE ADDRESS EXCEPT IT POINTS OVER THE FASTBUS.
;*      THE TEST THEN SETS ONE BIT IN EACH A.L.U. OF THE UNIBUS MAP
;*      AND TRIES TO REFERENCE MAIN MEMORY OVER THE UNIBUS.  SINCE THE
;*      MAP IS NOT ENABLED THE LOAD WILL GO TO MAIN MEMORY UNRELOCATED.
;*
;;*****************************************************************
014350                          TST23:
014350  000004                          SCOPE
014352  012737  014462  001324         MOV     #TST24,NXITST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
014360  012737  000020  001264 20$:     MOV     #TIMOUT,CPUEXP  ;MIGHT TIME OUT OVER UNIBUS
014366  012737  014424  001110         MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
014374  013700  172354                 MOV     KIPAR6,R0       ;PUT UNIBUS ADDRESS OF MAP REG IN R0
014400  072027  177773                 ASH     #-5,R0          ;RIGHT SHIFT R0 5 PLACES
014404  042700  007400                 BIC     #007400,R0      ;STRIP OFF EXTRANEOUS BITS.
014410  012720  021042                 MOV     #021042,(R0)+   ;SET BOTTOM BIT IN EACH ALU
014414  012710  000042                 MOV     #42,(R0)        ;SET BOTTOM BIT IN EACH ALU
014420  005037  120000                 CLR     @#120000        ;CLEAR TEST LOCATION VIA FAST BUS
014424  000240                 10$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
014426  012737  043207  140000         MOV     #43207,@#140000 ;LOAD TEST LOCATION VIA UNIBUS
                                                                ;THIS LOAD SHOULD NOT BE RELOCATED
                                                                ;BY THE UNIBUS MAP, SINCE BIT05 OF
                                                                ;MMR3 IS CLEAR.
014434  013703  120000                 MOV     @#120000,R3     ;READ TEST LOCATION VIA FAST BUS
014440  022703  043207                 CMP     #43207,R3       ;SEE IF DATA MATCHES
```

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                                                BEQ     1$              ;BRANCH IF DATA GOOD
                                                ERROR   32              ;MAP RELOCATED WHEN NOT ENABLED
014450  012737  014360  001110  1$:           MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
014456  005037  001264                        CLR     'CPUEXP         ;ZERO EXPECTED CPU TRAP CONDITION


                                                ;;*******************************************************************
                                                ;*TEST 24       SIZE JUMPER LOCATION
                                                ;*
                                                ;*      THIS TEST DETERMINES THE SETTING OF THE JUMPERS ON THE UNIBUS
                                                ;*      MAP WHICH ALLOW THE MAP TO RESPOND TO THOSE ADDRESSES BETWEEN
                                                ;*      THE JUMPER RANGE.  THE DEFAULT SETTING ALLOWS THE MAP TO RESPOND
                                                ;*      TO ADDRESSES 000000 - 757776 ON THE UNIBUS.  IF THE JUMPERS ARE
                                                ;*      NOT SET IN THEIR DEFAULT POSITION AN ERROR MESSAGE IS GIVEN, AND
                                                ;*      THE NUMBER THAT IS REMOVED BY THE JUMPER SETTING IS COMPARED WITH
                                                ;*      THE NUMBER THAT SHOULD NOT RESPOND.  IF THESE NUMBERS DON'T
                                                ;*      CORRESPOND THE ERROR COULD BE IN THE COMPARE CIRCUIT ON 'MAPX'.
                                                ;*
                                                ;;*******************************************************************
014462                                          TST24:
014462  000004                                    SCOPE
014464  012737  015120  001324                  MOV     #TST25,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                        ;FOR ESCAPE ON PARITY ERRORS
014472  012737  000001  001204                  MOV     #1,$TIMES       ;;DO 1 ITERATION
014500                                          SIZEJ:
014500  000004                                    SCOPE
014502  012737  014532  001106                  MOV     #20$,$LPADR     ;SET LOOP ON TEST POINTER TO 20$
014510  012737  014532  001110                  MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO 20$
014516  012737  000024  001102                  MOV     #24,$TSTNM      ;SETUP TEST NUMBER AND CLR ERROR FLAG
014524  013737  001102  177570                  MOV     $TSTNM,DISPLAY  ;DISPLAY TEST NUMBER FOR ALL TO SEE
014532  012737  000020  001264  20$:           MOV     #TIMOUT,CPUEXP  ;EXPECTING CPU TIME OUT ON UNIBUS
014540  012700  170200                        MOV     #MAPL0,R0       ;LOAD ADDRESS OF FIRST MAP REG
014544  012720  020000          1$:           MOV     #20000,(R0)+    ;LOAD 4K INTO ALL MAP REGISTERS
014550  005020                                CLR     (R0)+           ;INSURE THAT ALL REGS HAVE UPPER BITS CLR
014552  022700  170374                        CMP     #MAPL37,R0      ;SEE IF LAST REG IS LOADED
014556  101372                                BHI     1$              ;BRANCH IF THERE ARE MORE TO LOAD
014560  052737  000040  172516                BIS     #BIT5,@#MMR3    ;TURN ON MAP RELOCATION
014566  012700  117776                        MOV     #117776,R0      ;THIS WILL BE USED TO SELECT PAR 4
014572  012737  170000  172350                MOV     #170000,KIPAR4  ;WE START TESTING WITH MAP 0
014600  012701  000200                        MOV     #200,R1         ;CONSTANT USED TO ADD TO PAR 4
014604  012702  125252                        MOV     #125252,R2      ;CONSTANT TO LOAD INTO LOCATION 37776
014610  005037  037776          2$:           CLR     @#37776         ;CLEAR TEST LOCATION
014614  010210                                MOV     R2,(R0)         ;TRY TO LOAD TEST CELL THROUGH MAP
014616  023702  037776                        CMP     @#37776,R2      ;SEE IF TEST LOCATION WAS LOADED
014622  001411                                BEQ     3$              ;BRANCH IF IT WAS LOADED
014624  060137  172350                        ADD     R1,KIPAR4       ;CELL NOT LOADED, TEST NEXT MAP REG
014630  022737  177600  172350                CMP     #177600,KIPAR4  ;SEE IF YOU'RE POINTING TO I/O PAGE
014636  001364                                BNE     2$              ;GO TYPE NEXT MAP REGISTER
014640  104033                                ERROR   33              ;FATAL ERROR RESTARTING PROGRAM
014642  000137  010000                        JMP     START           ;RESTART PROGRAM
014646  013737  172350  001240  3$:           MOV     KIPAR4,LOWEST   ;FOUND THE LOWEST USABLE MAP REG
014654  013737  172350  001242  4$:           MOV     KIPAR4,HIGEST   ;THIS WILL END UP BEING LAST USABLE REG
014662  060137  172350                        ADD     R1,KIPAR4       ;TRY NEXT MAP REG TO SEE IF IT RESPONDS
014666  022737  177600  172350                CMP     #177600,KIPAR4  ;SEE IF ALL MAP REGS HAVE BEEN TRIED
014674  001433                                BEQ     7$              ;BRANCH IF ALL ARE DONE
014676  005037  037776                        CLR     @#37776         ;CLEAR TEST LOCATION
```

```
3164  014702  010210                  MOV     R2,(R0)         ;TRY TO LOAD TEST CELL THROUGH THE MAP
3165  014704  023702  037776          CMP     @#37776,R2      ;SEE IF TEST LOCATION WAS LOADED
3166  014710  001761                  BEQ     4$              ;BRANCH IF IT WAS LOADED
3167  014712  005037  037776  5$:     CLR     @#37776         ;CLEAR TEST LOCATION
3168  014716  005237  001254          INC     ERRCNT          ;COUNT OF REGS AFTER LAST ONE USABLE
3169  014722  010210                  MOV     R2,(R0)         ;TRY TO LOAD TEST CELL THRU MAP
3170  014724  023702  037776          CMP     @#37776,R2      ;SEE IF TEST LOCATION WAS LOADED
3171  014730  001402                  BEQ     6$              ;BRANCH IF LOCATION WAS LOADED
```

```
3172  014732  005237  001256              INC     CNTR            ;COUNT OF REGS THAT FAILED TO RESPOND
3173  014736  060137  172350      6$:     ADD     R1,KIPAR4       ;POINT TO NEXT MAP REG UNDER TEST
3174  014742  022737  177600  172350      CMP     #177600,KIPAR4  ;SEE IF TEST IS OVER
3175  014750  001360                      BNE     5$              ;BRANCH IF TEST NOT DONE
3176  014752  023737  001254  001256      CMP     ERRCNT,CNTR     ;SEE IF TRIES = FAILURES
3177  014760  001401                      BEQ     7$              ;BRANCH IF EQUAL
3178  014762  104034                      ERROR   34              ;MAP JUMPER COMPARE CIRCUIT BAD
```

```
3179  014764  005037  001254          7$:     CLR     ERRCNT          ;CLEAR TRIES COUNTER
3180  014770  005037  001256                  CLR     CNTR            ;CLEAR FAILURE COUNTER
3181  014774  005037  001264                  CLR     CPUEXP          ;NO CPU TRAPS EXPECTED IN NEXT TEST
3182  015000  005737  001100                  TST     $PASS           ;SEE IF THIS IS FIRST PASS
3183  015004  001045                          BNE     TST25           ;;GO TO NEXT TEST IF NOT THE FIRST PASS
3184  015006  023727  001240  170000          CMP     LOWEST,#170000  ;SEE IF LOWER JUMPER IS DEFAULT
3185  015014  001004                          BNE     8$              ;BRANCH IF NOT.
3186  015016  023727  001242  177400          CMP     HIGEST,#177400  ;SEE IF UPPER JUMPER IS DEFAULT.
3187  015024  001401                          BEQ     9$              ;BRANCH IF JUMPERS DEFAULT.
3188  015026  104035                  8$:     ERROR   35              ;MAP SIZE JUMPERS NOT DEFAULT
3189                                  ;:
3190                                  ;*      SETUP POINTERS TO THE LOWEST AND THE HIGHEST USEABLE
3191                                  ;*      MAPPING REGISTERS TO CONTINUE WITH TEST.
3192                                  ;:
3193  015030  013700  001242          9$:     MOV     HIGEST,R0
3194  015034  013701  001240                  MOV     LOWEST,R1
3195  015040  042700  170000                  BIC     #170000,R0
3196  015044  042701  170000                  BIC     #170000,R1
3197  015050  072027  177773                  ASH     #-5,R0          ;RIGHT SHIFT R0 5 PLACES
3198  015054  072127  177773                  ASH     #-5,R1          ;RIGHT SHIFT R1 5 PLACES
3199  015060  062701  170200                  ADD     #170200,R1
3200  015064  062700  170200                  ADD     #170200,R0
3201  015070  010137  001244                  MOV     R1,LREGL
3202  015074  062701  000002                  ADD     #2,R1           ;POINT TO UPPER BITS OF MAP REG
3203  015100  010137  001246                  MOV     R1,LREGU
3204  015104  010037  001250                  MOV     R0,HREGL
3205  015110  062700  000002                  ADD     #2,R0           ;POINT TO UPPER BITS OF MAP REG
3206  015114  010037  001252                  MOV     R0,HREGU
3207
3208
3209
```

```
3210                                    ;;*****************************************************************
3211                                    ;*TEST 25       ENSURE THAT THERE IS NO DUAL MAPPING
3212                                    ;*
3213                                    ;*      THIS TEST VERIFIES THAT THE OTHER INPUT (X) TO THE ADDRESS
3214                                    ;*      MULTIPLEXER ON 'MAPC' IS FUNCTIONING PROPERLY.  IT CLEARS
3215                                    ;*      ALL THE MAP REGISTERS EXCEPT THE ONE UNDER TEST, AND LOADS
3216                                    ;*      THAT ONE WITH 00020000.  THE TEST THEN USES A VIRTUAL ADDRESS
3217                                    ;*      TO SELECT THAT MAP REGISTER AND ADD 17776, SO THAT IT SHOULD
3218                                    ;*      REFERENCE ADDRESS 00037776.  A REFERENCE IS MADE THROUGH EACH
3219                                    ;*      OF THE REGISTERS AND ANY THAT FETCH THE CORRECT DATA ARE CHECKED
3220                                    ;*      TO SEE THAT IT WAS THE MAP REGISTER UNDER TEST.  IF NOT BOTH THE
3221                                    ;*      MAP REGISTER UNDER TEST AND THE DUALED REGISTER ARE REPORTED.
3222                                    ;*
3223
3224                                    ;;*****************************************************************
3225  015120                            TST25:
3226  015120  000004                           SCOPE
3227  015122  012737  015314  001324           MOV     #TST26,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3228                                                                   ;FOR ESCAPE ON PARITY ERRORS
3229  015130  012737  000144  001204           MOV     #144,$TIMES     ;;DO 144 ITERATIONS
3230  015136  004737  005134           20$:    JSR     PC,CLRMAP       ;CLEAR ALL MAP REGISTERS
3231  015142  005037  001170                   CLR     $TMP0           ;USED AS FLAG IN TEST
3232  015146  012703  100000                   MOV     #100000,R3      ;SELECT P.A.R. 4 OFFSET OF ZERO
3233  015152  012737  015204  001110           MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
3234  015160  013702  001244                   MOV     LREGL,R2        ;PUT ADDRESS OF LOWEST USABLE MAP REG IN R2
3235  015164  013700  001240                   MOV     LOWEST,R0       ;MAP REGISTER UNDER TEST IN R0
3236  015170  013701  001240           1$:     MOV     LOWEST,R1       ;MAP REGISTER USED IN CURRENT REFERENCE
3237  015174  012712  040000                   MOV     #40000,(R2)     ;LOAD MAP REG UNDER TEST WITH 8K BASE
3238  015200  010237  040000                   MOV     R2,@#40000      ;LOAD TEST LOCATION WITH THE ADDRESS
3239                                                                   ;OF THE MAP REGISTER UNDER TEST
3240  015204  010137  172350           2$:     MOV     R1,KIPAR4       ;LOAD PAR 4 WITH NEXT MAP REG UNIBUS ADDR
3241  015210  011304                           MOV     (R3),R4         ;READ THROUGH THE MAP
3242  015212  020402                           CMP     R4,R2           ;SEE IF CORRECT DATA WAS FETCHED
3243  015214  001010                           BNE     4$              ;BRANCH IF NO MATCH
3244  015216  020001                           CMP     R0,R1           ;SEE IF MAP REGS ARE THE SAME
3245  015220  001403                           BEQ     3$              ;BRANCH IF CORRECT MAP REG WAS USED
3246  015222  004737  005356                   JSR     PC,DUALADR      ;LOG AND REPORT ALL ERRORS
3247  015226  000403                           BR      4$              ;SKIP NEXT INSTRUCTION
3248  015230  012737  000001  001170   3$:     MOV     #1,$TMP0        ;SET FLAG WHEN ADDRS MATCH
3249  015236  062701  000200           4$:     ADD     #200,R1         ;TRY NEXT MAP REG
3250  015242  023701  001242                   CMP     HIGEST,R1       ;SEE IF ALL HAVE BEEN TRIED
3251  015246  103356                           BHIS    2$              ;BRANCH IF STILL MORE TO TRY
3252  015250  005737  001170                   TST     $TMP0           ;SEE THAT THERE WAS A SUCCESSFUL MATCH
3253  015254  001001                           BNE     5$              ;BRANCH IF THERE WAS
3254  015256  104036                           ERROR   36              ;DID NOT MATCH MAP REG ADDRESS
3255  015260  005037  001170           5$:     CLR     $TMP0           ;CLEAR FLAG FOR NEXT REG
3256  015264  005012                           CLR     (R2)            ;CLEAR MAP REG JUST TESTED
3257  015266  062702  000004                   ADD     #4,R2           ;POINT TO NEXT MAP REG TO LOAD
3258  015272  062700  000200                   ADD     #200,R0         ;POINT TO NEXT MAP REG UNDER TEST
3259  015276  023700  001242                   CMP     HIGEST,R0       ;SEE IF ALL MAP REGS HAVE BEEN TESTED
3260  015302  103332                           BHIS    1$              ;BRANCH IF STILL MORE TO TEST
3261  015304  005737  001254                   TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
3262  015310  001401                           BEQ     TST26           ;;BRANCH TO NEXT TEST IF NO ERRORS
3263  015312  104013                           ERROR   13              ;ERROR TYPE OUT ITEM 13
3264
3265
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3266
3267
3268                                    ;;*********************************************************************
3269                                    ;*TEST 26       LOAD LOCATIONS 40000 - 137776 WITH THEIR ADDRESSES
3270                                    ;*
3271                                    ;*      THIS TEST IS USED TO LOAD MAIN MEMORY FROM ADDRESS 00040000 TO
3272                                    ;*      ADDRESS 00137776 WITH ITS OWN ADDRESS.  IT THEN CHECKS THAT
3273                                    ;*      MEMORY OVER THE UNIBUS AND LOGS ANG REPORTS ANY ERRORS THAT
3274                                    ;*      IT FINDS.
3275                                    ;*
3276                                    ;;*********************************************************************
3277  015314                            TST26:
3278  015314  000004                           SCOPE
3279  015316  012737  015574  001324            MOV     #TST27,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3280                                                                    ;FOR ESCAPE ON PARITY ERRORS
3281  015324  042737  000040  172516            BIC     #BIT5,MMR3      ;TURN OFF MAP RELOCATION
3282  015332  012737  000400  172350            MOV     #400,KIPAR4     ;MAP PAGE 4 TO 8K
3283  015340  012700  040000                    MOV     #40000,R0       ;STARTING ADDRESS FOR DATA PATTERN
3284  015344  012701  100000          1$:       MOV     #100000,R1      ;VIRTUAL ADDRESS
3285  015350  012702  010000                    MOV     #^D4096,R2      ;LOAD 4096 LOCATIONS AT A TIME
3286  015354  010021                2$:       MOV     R0,(R1)+        ;LOAD PHY. ADDR. INTO EACH MEMORY LOC.
3287  015356  062700  000002                    ADD     #2,R0           ;POINT TO NEXT PHYSICAL ADDRESS
3288  015362  077204                           SOB     R2,2$           ;BRANCH IF 4K OF MEMORY NOT LOADED
3289  015364  062737  000200  172350            ADD     #200,KIPAR4     ;POINT TO NEXT 4K BANK OF MEMORY
3290  015372  022737  001400  172350            CMP     #1400,KIPAR4    ;SEE IF 24K IS LOADED
3291  015400  101361                           BHI     1$              ;BRANCH IF MORE MEMORY TO LOAD
3292                                    ;*
3293                                    ;*      MEMORY FROM 8K - 24K IS NOW LOADED WITH ITS OWN ADDRESS
3294                                    ;*
3295  015402  012737  015410  001106            MOV     #20$,$LPADR     ;SET LOOP ADDRESS TO 20$
3296  015410  012737  015446  001110  20$:       MOV     #4$,$LPERR      ;SET LOOP ON ERROR POINTER TO 4$
3297  015416  022737  171400  172354            CMP     #171400,KIPAR6  ;DID I USE ANY MAP REGISTER
3298                                                                    ;BELOW REGISTER 6 (UB. ADDR 140000)
3299  015424  101463                           BLOS    TST27           ;;BRANCH TO NEXT TEST IF NOT
3300  015426  013700  172354                    MOV     KIPAR6,R0       ;LOAD PAR6 INTO R0 TO GET
3301                                                                    ;THE STARTING DATA PATTERN
3302  015432  072027  000006                    ASH     #6,R0           ;R0 NOW HOLDS THE STARTING DATA PATTERN
3303  015436  012701  140000          3$:       MOV     #140000,R1      ;STARTING VIRTUAL ADDRESS
3304  015442  012702  010000                    MOV     #^D4096,R2      ;PREPARE TO READ 4K AT A TIME
3305  015446  000240                4$:       NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3306  015450  011103                           MOV     (R1),R3         ;READ MAIN MEMORY THRU UNIBUS
3307  015452  020003                           CMP     R0,R3           ;SEE IF THE ADDRESSES MATCH
3308  015454  001015                           BNE     6$              ;BRANCH IF ERROR
3309  015456  062701  000002          5$:       ADD     #2,R1           ;CHANGE VIRTUAL ADDRESS
3310  015462  062700  000002                    ADD     #2,R0           ;CHANGE PHYSICAL ADDRESS
3311  015466  077211                           SOB     R2,4$           ;BRANCH IF 4K OF MEMORY NOT READ
3312  015470  062737  000200  172354            ADD     #200,KIPAR6     ;POINT TO NEXT BANK OF 4K THRU UNIBUS
3313  015476  022737  171400  172354            CMP     #171400,KIPAR6  ;SEE IF THIS POINTS TO 24K PLUS 2
3314  015504  101354                           BHI     3$              ;BRANCH IF 24K OF MEMORY NOT CHECKED
3315  015506  000423                           BR      10$             ;TEST FINISHED, BRANCH TO EXIT
3316
3317  015510                            6$:
3318  015510  005100                           COM     R0              ;GET R0 READY FOR AND
3319  015512  040037  001224                    BIC     R0,ADRAND               ;PERFORM LOGICAL AND
3320  015516  005100                           COM     R0              ;PUT R0 BACK AS IT WAS
3321  015520  005103                           COM     R3              ;GET R3 READY FOR AND
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3322  015522  040337  001230                  BIC     R3,DATAND               ;PERFORM LOGICAL AND
3323  015526  005103                          COM     R3                      ;PUT R3 BACK AS IT WAS
3324  015530  050037  001226                  BIS     R0,ADDROR               ;LOGICAL OR OF PHYSICAL ADDRESS
3325  015534  050337  001232                  BIS     R3,DATAOR               ;LOGICAL OR OF ADDRESS FETCHED
3326  015540  005737  001254                  TST     ERRCNT                  ;IS THIS THE FIRST ERROR HERE?
3327  015544  001002                          BNE     7$                      ;BRANCH IF NOT FIRST ERROR
3328  015546  104206                          ERROR   206                     ;DIDN'T READ ADDRESSES RIGHT FROM UNIBUS
3329  015550  000742                          BR      5$                      ;CONTINUE TESTING
3330  015552  104306                  7$:     ERROR   306                     ;REPORT MORE DATA FROM UNIBUS
3331  015554  000740                          BR      5$                      ;CONTINUE WITH TEST
3332  015556  005737  001254          10$:    TST     ERRCNT                  ;WERE THERE ANY ERRORS ON THIS TEST?
3333  015562  001401                          BEQ     19$                     ;BRANCH IF NO ERRORS ON THIS TEST
3334  015564  104037                          ERROR   37                      ;SUMMARY OF UNIBUS ADDRESS FAILURES
3335  015566  012737  015410  001110  19$:    MOV     #20$,$LPERR             ;SET LOOP POINTER TO 20$
3336
3337
3338                                  ;;**********************************************************************
3339                                  ;*TEST 27       MAIN MEMORY TIMEOUT THROUGH MAP
3340                                  ;*
3341                                  ;*      THIS TEST GENERATES A TIME OUT THROUGH THE UNIBUS MAP BY TRYING
3342                                  ;*      TO REFERENCE ADDRESS 17000000 IN MAIN MEMORY.  IT USES THE LOWEST
3343                                  ;*      USEABLE MAP REGISTER, WHICH IN THE DEFAULT CASE IS MAP REGISTER
3344                                  ;*      ZERO.
3345                                  ;*
3346                                  ;;**********************************************************************
3347  015574                          TST27:
3348  015574  000004                          SCOPE
3349  015576  012737  015706  001324          MOV     #TST30,NXTTST           ;SAVE STARTING ADDRESS OF NEXT TEST
3350                                                                          ;FOR ESCAPE ON PARITY ERRORS
3351  015604  052737  000040  172516  20$:    BIS     #BIT5,MMR3              ;TURN MAP RELOCATION BACK ON
3352  015612  012737  000020  001264          MOV     #TIMOUT,CPUEXP          ;EXPECTING TIMEOUT IN THIS TEST
3353  015620  013737  001240  172350          MOV     LOWEST,KIPAR4           ;LOAD PAR 4 WITH LOWEST USABLE MAP REG
3354  015626  012777  000074  163412          MOV     #74,@LREGU              ;LOAD UPPER 6 BITS OF LOWEST MAP REG
3355  015634  012777  000000  163402          MOV     #000000,@LREGL          ;LOAD LOWER 16 BITS OF LOWEST MAP REG
3356  015642  012737  015650  001110          MOV     #1$,$LPERR              ;SET LOOP ON ERROR POINTER TO 1$
3357  015650  005037  001266          1$:     CLR     PCPUER                  ;CPU ERROR REG LOCATION
3358  015654  000240                          NOP                             ;THIS IS A SYNC POINT FOR SCOPING
3359  015656  013703  100000                  MOV     @#100000,R3             ;TRY TO READ THRU PAGE 4
3360                                                                          ;THIS REFERENCE WILL GO OUT ON THE
3361                                                                          ;UNIBUS TO SELECT THE LOWEST USEABLE
3362                                                                          ;MAP REGISTER (DEFAULT MAP REG. 0).
3363                                                                          ;PHYSICAL ADDRESS 17700000 IS THEN
3364                                                                          ;GENERATED, WHICH SHOULD TIME OUT SINCE
3365                                                                          ;IT IS THE FIRST NON-EXISTANT LOCATION.
3366  015662  022737  000020  001266          CMP     #TIMOUT,PCPUER          ;THE UNIBUS SHOULD HAVE TIMED OUT
3367  015670  001401                          BEQ     10$                     ;BRANCH IF CONDITION WAS CORRECT
3368  015672  104040                          ERROR   40                      ;UNIBUS DID NOT TIME OUT
3369  015674  012737  015604  001110  10$:    MOV     #20$,$LPERR             ;SET LOOP POINTER TO START OF TEST
3370  015702  005037  001264                  CLR     CPUEXP                  ;NO CPU TRAPS EXPECTED FOR AWHILE
3371
3372
3373                                  ;;**********************************************************************
3374                                  ;*TEST 30       RELOCATION TEST USING LOWEST USABLE MAPPING REG
3375                                  ;*
3376                                  ;*      THIS TEST CHECKS OUT THE FULL ADDITION PROPERTIES OF THE UNIBUS
3377                                  ;*      MAP A.L.U..  IN THE DEFAULT CASE IT USES MAP REGISTER ZERO BUT
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                                        ;*      IF THE MAP JUMPERS HAVE BEEN ALTERED TO DE-SELECT SOME MAP REGISTERS
                                        ;*      THIS TEST WILL USE THE LOWEST USEABLE MAP REGISTER.
                                        ;*      IF AN ERROR OCCURS THE TEST WILL REPORT THE PHYSICAL ADDRESS
                                        ;*      THAT WAS DESIRED, AND THE DATA AT THE ADDRESS THAT WAS REFERENCED.
                                        ;*
                                        ;;*****************************************************************
015706                                  TST30:
015706  000004                                  SCOPE
015710  012737  016614  001324                  MOV     #TST31,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                        ;FOR ESCAPE ON PARITY ERRORS
                                        ;;
                                        ;*THE RELOCATION HERE USES A BASE OF 00060000 AND AN
                                        ;*OFFSET OF 00000 TO PRODUCE AN ADDRESS OF 00060000
                                        ;;
015716  012737  015750  001110  100$:   MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
015724  005077  163316                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
015730  012777  060000  163306          MOV     #060000,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
015736  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
015744  012700  140000                  MOV     #140000,R0      ;SELECT PAR6, OFFSET IS 00000
015750  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
015752  011001                          MOV     (R0),R1         ;READ LOCATION 060000 THRU THE UNIBUS
015754  012702  060000                  MOV     #060000,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 060000
015760  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
015762  001401                          BEQ     2$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
015764  104041                          ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
                                        ;;
                                        ;*THE RELOCATION HERE USES A BASE OF 00052524 AND AN
                                        ;*OFFSET OF 05252 TO PRODUCE AN ADDRESS OF 00057776
                                        ;;
015766  012737  016020  001110  2$:     MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
015774  005077  163246                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
016000  012777  052524  163236          MOV     #052524,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
016006  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
016014  012700  145252                  MOV     #145252,R0      ;SELECT PAR6, OFFSET IS 05252
016020  000240                  3$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
016022  011001                          MOV     (R0),R1         ;READ LOCATION 057776 THRU THE UNIBUS
016024  012702  057776                  MOV     #057776,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 057776
016030  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
016032  001401                          BEQ     4$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
016034  104041                          ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
                                        ;;
                                        ;*THE RELOCATION HERE USES A BASE OF 00045252 AND AN
                                        ;*OFFSET OF 12524 TO PRODUCE AN ADDRESS OF 00057776
                                        ;;
016036  012737  016070  001110  4$:     MOV     #5$,$LPERR      ;SET LOOP ON ERROR POINTER TO 5$
016044  005077  163176                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
016050  012777  045252  163166          MOV     #045252,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
016056  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
016064  012700  152524                  MOV     #152524,R0      ;SELECT PAR6, OFFSET IS 12524
016070  000240                  5$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
016072  011001                          MOV     (R0),R1         ;READ LOCATION 057776 THRU THE UNIBUS
016074  012702  057776                  MOV     #057776,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 057776
016100  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
016102  001401                          BEQ     6$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
016104  104041                          ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
                                        ;;
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3434                                        ;*THE RELOCATION HERE USES A BASE OF 00050420 AND AN
3435                                        ;*OFFSET OF 10420 TO PRODUCE AN ADDRESS OF 00061040
3436                                        ;;
3437  016106  012737  016140  001110  6$:     MOV     #7$,$LPERR      ;SET LOOP ON ERROR POINTER TO 7$
3438  016114  005077  163126                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3439  016120  012777  050420  163116         MOV     #050420,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3440  016126  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3441  016134  012700  150420                 MOV     #150420,R0      ;SELECT PAR6, OFFSET IS 10420
3442  016140  000240                  7$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3443  016142  011001                         MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3444  016144  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
3445  016150  020102                         CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3446  016152  001401                         BEQ     8$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3447  016154  104041                         ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3448                                        ;;
3449                                        ;*THE RELOCATION HERE USES A BASE OF 00054630 AND AN
3450                                        ;*OFFSET OF 04210 TO PRODUCE AN ADDRESS OF 00061040
3451                                        ;;
3452  016156  012737  016210  001110  8$:     MOV     #9$,$LPERR      ;SET LOOP ON ERROR POINTER TO 9$
3453  016164  005077  163056                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3454  016170  012777  054630  163046         MOV     #054630,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3455  016176  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3456  016204  012700  144210                 MOV     #144210,R0      ;SELECT PAR6, OFFSET IS 04210
3457  016210  000240                  9$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3458  016212  011001                         MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3459  016214  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
3460  016220  020102                         CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3461  016222  001401                         BEQ     10$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3462  016224  104041                         ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3463                                        ;;
3464                                        ;*THE RELOCATION HERE USES A BASE OF 00044210 AND AN
3465                                        ;*OFFSET OF 14630 TO PRODUCE AN ADDRESS OF 00061040
3466                                        ;;
3467  016226  012737  016260  001110  10$:    MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
3468  016234  005077  163006                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3469  016240  012777  044210  162776         MOV     #044210,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3470  016246  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3471  016254  012700  154630                 MOV     #154630,R0      ;SELECT PAR6, OFFSET IS 14630
3472  016260  000240                  11$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3473  016262  011001                         MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3474  016264  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
3475  016270  020102                         CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3476  016272  001401                         BEQ     12$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3477  016274  104041                         ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3478                                        ;;
3479                                        ;*THE RELOCATION HERE USES A BASE OF 00056734 AND AN
3480                                        ;*OFFSET OF 02104 TO PRODUCE AN ADDRESS OF 00061040
3481                                        ;;
3482  016276  012737  016330  001110  12$:    MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
3483  016304  005077  162736                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3484  016310  012777  056734  162726         MOV     #056734,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3485  016316  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3486  016324  012700  142104                 MOV     #142104,R0      ;SELECT PAR6, OFFSET IS 02104
3487  016330  000240                  13$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3488  016332  011001                         MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3489  016334  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
```

```
3490  016340  020102                        CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3491  016342  001401                        BEQ     14$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3492  016344  104041                        ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3493                                  ;;
3494                                  ;*THE RELOCATION HERE USES A BASE OF 00042104 AND AN
3495                                  ;*OFFSET OF 16734 TO PRODUCE AN ADDRESS OF 00061040
3496                                  ;;
3497  016346  012737  016400  001110  14$:    MOV     #15$,$LPERR     ;SET LOOP ON ERROR POINTER TO 15$
3498  016354  005077  162666                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3499  016360  012777  042104  162656         MOV     #042104,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3500  016366  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3501  016374  012700  156734                 MOV     #156734,R0      ;SELECT PAR6, OFFSET IS 16734
3502  016400  000240                  15$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3503  016402  011001                        MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3504  016404  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
3505  016410  020102                        CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3506  016412  001401                        BEQ     16$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3507  016414  104041                        ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3508                                  ;;
3509                                  ;*THE RELOCATION HERE USES A BASE OF 00057776 AND AN
3510                                  ;*OFFSET OF 01042 TO PRODUCE AN ADDRESS OF 00061040
3511                                  ;;
3512  016416  012737  016450  001110  16$:    MOV     #17$,$LPERR     ;SET LOOP ON ERROR POINTER TO 17$
3513  016424  005077  162616                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3514  016430  012777  057776  162606         MOV     #057776,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3515  016436  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3516  016444  012700  141042                 MOV     #141042,R0      ;SELECT PAR6, OFFSET IS 01042
3517  016450  000240                  17$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3518  016452  011001                        MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3519  016454  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
3520  016460  020102                        CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3521  016462  001401                        BEQ     18$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3522  016464  104041                        ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3523                                  ;;
3524                                  ;*THE RELOCATION HERE USES A BASE OF 00041042 AND AN
3525                                  ;*OFFSET OF 17776 TO PRODUCE AN ADDRESS OF 00061040
3526                                  ;;
3527  016466  012737  016520  001110  18$:    MOV     #19$,$LPERR     ;SET LOOP ON ERROR POINTER TO 19$
3528  016474  005077  162546                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3529  016500  012777  041042  162536         MOV     #041042,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3530  016506  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3531  016514  012700  157776                 MOV     #157776,R0      ;SELECT PAR6, OFFSET IS 17776
3532  016520  000240                  19$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3533  016522  011001                        MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
3534  016524  012702  061040                 MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
3535  016530  020102                        CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3536  016532  001401                        BEQ     20$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3537  016534  104041                        ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3538                                  ;;
3539                                  ;*THE RELOCATION HERE USES A BASE OF 00057776 AND AN
3540                                  ;*OFFSET OF 00002 TO PRODUCE AN ADDRESS OF 00060000
3541                                  ;;
3542  016536  012737  016570  001110  20$:    MOV     #21$,$LPERR     ;SET LOOP ON ERROR POINTER TO 21$
3543  016544  005077  162476                 CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3544  016550  012777  057776  162466         MOV     #057776,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3545  016556  013737  001240  172354         MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
```

```
3546  016564  012700  140002              MOV     #140002,R0      ;SELECT PAR6, OFFSET IS 00002
3547  016570  000240                21$:  NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3548  016572  011001                      MOV     (R0),R1         ;READ LOCATION 060000 THRU THE UNIBUS
3549  016574  012702  060000              MOV     #060000,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 060000
3550  016600  020102                      CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3551  016602  001401                      BEQ     22$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3552  016604  104041                      ERROR   41              ;FAULTY RELOCATION BY UNIBUS MAP
3553  016606  012737  015716  001110  22$:  MOV     #100$,$LPERR    ;SET LOOP POINTER TO START OF TEST
3554
3555
3556                                      ;;*****************************************************************
3557                                      ;*TEST 31       TEST CARRY PROPAGATION OF MAP'S RELOCATION ADDER
3558                                      ;*
3559                                      ;*      EVERY ADDRESS OF THE FORM XXXX0000 IS GENERATED HERE STARTING
3560                                      ;*      WITH 00030000 UP TO 17000000.  THAT IS, THE FIRST OF EVERY 2K
3561                                      ;*      WORDS IS ADDRESSED, TO INSURE THAT THE ADDER IN THE MAP IS
3562                                      ;*      WORKING PROPERLY AND, THE SYSTEM SIZE JUMPERS ARE ACTUALLY SET
3563                                      ;*      FOR THE TOP OF MAIN MEMORY.
3564                                      ;*
3565                                      ;;*****************************************************************
3566  016614                              TST31:
3567  016614  000004                      SCOPE
3568  016616  012737  017120  001324      MOV     #TST32,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3569                                                              ;FOR ESCAPE ON PARITY ERRORS
3570  016624  012737  000012  001204      MOV     #12,$TIMES      ;;DO 12 ITERATIONS
3571                                      .EQUIV  BIT5,NEXMEM     ;BIT05 IS NON-EXISTANT MEMORY BIT IN
3572                                                              ;THE CPU ERROR REGISTER
3573  016632  012737  177777  016766  20$:  MOV     #-1,4$          ;INITIALIZE FLAG AS NEGATIVE ONE
3574  016640  005077  162402              CLR     @LREGU          ;CLEAR UPPER 6 BITS OF MAP REG
3575  016644  012777  020000  162372      MOV     #20000,@LREGL   ;LOAD 4K BASE INTO MAP REGISTER
3576  016652  012701  100100              MOV     #100100,R1      ;LOAD BITS TO SELECT PAR 4, OFFSET 100
3577  016656  012700  150000              MOV     #150000,R0      ;LOAD BITS TO SELECT PAR 6, OFFSET 2K
3578  016662  012737  000277  172350      MOV     #277,KIPAR4     ;START WITH PHYSICAL 6K
3579  016670  013737  001240  172354      MOV     LOWEST,KIPAR6   ;LOAD PAR 6 WITH MAP REG'S ADDR
3580  016676  012737  016736  001110      MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
3581  016704  012737  000020  001264  3$:  MOV     #20,CPUEXP      ;EXPECTING A UNIBUS TIME OUT DURING TEST
3582  016712  005037  001266              CLR     PCPUER          ;CLEAR TIME OUT FLAG
3583  016716  013710  001326              MOV     DATA,(R0)       ;THIS LOAD WILL TIME OUT WHEN YOU
3584                                                              ;HAVE REACHED THE TOP OF MEMORY
3585                                                              ;IT SELECTS PAR 6 WHICH WILL PUT ADDR
3586                                                              ;<XXX XX1>0000 ON THE UNIBUS.
3587                                                              ;THE X'S WILL SELECT THE LOWEST USEABLE
3588                                                              ;MAPPING REGISTER.  THE DEFAULT CASE IS
3589                                                              ;010000,  SELECTING MAPPING REGISTER 0.
3590  016722  005737  001266              TST     PCPUER          ;SEE IF THERE WAS MAIN MEMORY
3591  016726  001016                      BNE     1$              ;BRANCH IF NO MAIN MEMORY FROM UNIBUS
3592  016730  012737  000040  001264      MOV     #NEXMEM,CPUEXP  ;POSSIBLE CACHE NON-EXISTANT MEMORY
3593  016736  011103              10$:    MOV     (R1),R3         ;READ TEST LOCATION VIA FASTBUS
3594  016740  022737  000040  001266      CMP     #NEXMEM,PCPUER  ;WAS THIS CACHE NON-EXISTANT MEMORY
3595  016746  001414                      BEQ     2$              ;BRANCH IF NON-EXSITANT MEMORY
3596  016750  000240                      NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3597  016752  011002                      MOV     (R0),R2         ;READ TEST LOCATION VIA UNIBUS MAP
3598  016754  020203                      CMP     R2,R3           ;COMPARE TEST DATA R2=MAP DATA
3599                                                              ;R3=FASTBUS DATA
3600  016756  001410                      BEQ     2$              ;BRANCH IF IT WAS THE SAME
3601  016760  104042                      ERROR   42              ;CARRY PROPAGATION FAILURE IN MAP
```

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3602  016762  000406                        BR      2$              ;BRANCH TO UPDATE ROUTINE
3603  016764  005227                  1$:   INC     (PC)+           ;INCREMENT ONE TIME ENTRANCE FLAG
3604  016766  177777                  4$:   .WORD   -1              ;USE NEGATIVE ONE FOR FLAG
3605  016770  001003                        BNE     2$              ;BRANCH IF YOU'VE BEEN HERE BEFORE
3606  016772  013737  172350  001320        MOV     KIPAR4,RSIZE    ;SAVE UPPER LIMIT OF MEMORY
3607  017000  062737  000100  001326  2$:   ADD     #100,DATA       ;CHANGE PATTERN FOR NEXT LOAD
3608  017006  062737  000100  172350        ADD     #100,KIPAR4     ;ADD 2K TO PAR4
3609  017014  062777  010000  162222        ADD     #10000,@LREGL   ;ADD 2K TO MAP REGISTER
3610  017022  001330                        BNE     3$              ;BRANCH IF MAP REGISTER NOT ZERO
3611  017024  005277  162216                INC     @LREGU          ;ADD ONE TO UPPER 6 BITS OF MAP REG
3612  017030  022777  000073  162210        CMP     #73,@LREGU      ;SEE IF TOP 128K BLOCK HAS BEEN PASSED
3613  017036  103322                        BHIS    3$              ;BRANCH IF NOT PAST IT
3614  017040  005237  001326                INC     DATA            ;CHANGE DATA PATTERN FOR NEXT PASS
3615  017044  042737  177700  001326        BIC     #177700,DATA    ;CLEAR UPPER 10 BITS OF DATA PATTERN
3616  017052  052737  000300  001326        BIS     #300,DATA       ;START WITH 3XX IN DATA PATTERN
3617  017060  012737  016632  001110        MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3618  017066  023737  177760  001320        CMP     @#SIZELO,RSIZE  ;SEE IF SIZE JUMPERS AGREE WITH MEMORY TOP
3619  017074  001407                        BEQ     19$             ;BRANCH IF TOP OF MEMORY AGREES WITH
3620                                                                ;THE SIZE JUMPERS
3621  017076  105737  001331                TSTB    KB11EM          ;RUNNING ON A KB11-EM?
3622  017102  001004                        BNE     19$             ;SKIP ERROR IF YES
3623  017104  105737  001332                TSTB    KB11CM          ;RUNNING ON MODIFIED MACHINE?
3624  017110  001001                        BNE     19$             ;BRANCH IF YES
3625  017112  104043                        ERROR   43              ;TOP OF MEMORY DOESN'T MATCH SIZE JUMPER
3626  017114  005037  001264          19$:  CLR     CPUEXP          ;NO CPU TRAPS EXPECTED FOR AWHILE
3627
3628
3629
3630                                ;;*****************************************************************
3631                                ;*TEST 32       PARITY REPORTING THRU THE MAP, MAIN MEMORY EVEN WORD
3632                                ;*
3633                                ;*      THIS TEST FORCES A PARITY ERROR IN MAIN MEMORY AT PHYSICAL
3634                                ;*      ADDRESS 00040000 BY SETTING ONE BIT IN EACH BYTE OF THE
3635                                ;*      WORD.  THE TEST THEN FORCES THE EVEN WORD PARITY BITS TO
3636                                ;*      ONES AND READS ADDRESS 00040000 THRU THE UNIBUS MAP.  THEN
3637                                ;*      IT CHECKS TO SEE THAT THE PARITY ABORT OCCURRED AND THAT THE
3638                                ;*      CONDITION WAS CORRECT BEFORE GOING TO THE NEXT TEST.
3639                                ;*
3640                                ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
3641                                ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
3642                                ;*
3643                                ;*****************************************************************
3644  017120                        TST32:
3645  017120  000004                        SCOPE
3646  017122  012737  017362  001324        MOV     #TST33,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3647                                                                ;FOR ESCAPE ON PARITY ERRORS
3648  017130  104416                        TBITO                   ;TURN OFF T BIT TRAPPING IF ON
3649  017132  012737  023404  001200  20$:  MOV     #23404,$TMP4    ;EXPECTED ERROR CONDITION
3650  017140  005037  001274                CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
3651  017144  012737  177777  177744        MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
3652  017152  013737  177746  001202        MOV     @#CONTRL,$TMP5  ;SAVE CONTROL REG TO RESTORE CACHE
3653  017160  012737  000014  177746        MOV     #14,@#CONTRL    ;FORCE MISSES IN CACHE
3654  017166  013737  001240  172354        MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MAP REG IN PAR6
3655  017174  012777  040000  162042        MOV     #40000,@LREGL   ;LOWEST MAP REGISTER POINTS TO 8K
3656  017202  005077  162040                CLR     @LREGU          ;CLEAR UPPER BITS OF MAP REG
3657  017206  012701  177750                MOV     #MAINT,R1       ;PUT ADDR OF MAINT REG IN R1
```

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3658  017212  012737  017236  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
3659  017220  012700  140000                  MOV     #140000,R0      ;SELECT KIPAR6, OFFSET 0
3660  017224  012710  020001                  MOV     #20001,(R0)     ;LOAD ONE BIT IN EACH BYTE OF 40000
3661  017230  012737  017322  000114          MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
3662  017236  012737  030000  177750  1$:     MOV     #30000,@#MAINT  ;FORCE EVEN WORD PARITY BITS TO ONE
3663  017244  000240                          NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3664  017246  011003                          MOV     (R0),R3         ;''DATA FETCH'' SHOULD CAUSE PARITY ABORT
3665  017250  011102                          MOV     (R1),R2         ;SAVE MAINT REG IN CASE NO TRAP
3666  017252  005011                          CLR     (R1)            ;CLEAR MAINT REG IN CASE NO TRAP
3667  017254  050000                          BIS     R0,R0           ;DUMMY INST WITH P.B.'S ON
3668  017256  023737  001200  001274          CMP     $TMP4,PPARER    ;SEE IF ERROR REG HOLDS RIGHT DATA
3669  017264  001401                          BEQ     2$              ;BRANCH IF CONDITION WAS CORRECT
3670  017266  104044                          ERROR   44              ;PARITY REPORTING BAD
3671  017270  012737  177777  177744  2$:     MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
3672  017276  012737  005764  000114          MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
3673  017304  013737  001202  177746          MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
3674  017312  012737  017132  001110          MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3675  017320  000420                          BR      TST33           ;;TEST OVER GO TO NEXT TEST
3676
3677
3678  017322  013737  177740  001270  10$:     MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
3679  017330  013737  177742  001272          MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
3680  017336  013737  177744  001274          MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
3681  017344  013737  177746  001276          MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
3682  017352  012737  030000  001300          MOV     #30000,PMAINT   ;SAVE DATA IN MAINTENENCE REGISTER
3683  017360  000002                          RTI                     ;RETURN TO TEST AND CHECK PARITY
3684
3685
3686                                  ;;**********************************************************************
3687                                  ;*TEST 33       PARITY REPORTING THRU THE MAP, MAIN MEMORY ODD WORD
3688                                  ;*
3689                                  ;*      THIS TEST FORCES A PARITY ERROR IN MAIN MEMORY AT PHYSICAL
3690                                  ;*      ADDRESS 00040002 BY SETTING ONE BIT IN EACH BYTE OF THE
3691                                  ;*      WORD.  THE TEST THEN FORCES THE ODD WORD PARITY BITS TO
3692                                  ;*      ONES AND READS ADDRESS 00040002 THRU THE UNIBUS MAP.  THEN
3693                                  ;*      IT CHECKS TO SEE THAT THE PARITY ABORT OCCURRED AND THAT THE
3694                                  ;*      CONDITION WAS CORRECT BEFORE GOING TO THE NEXT TEST.
3695                                  ;*
3696                                  ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
3697                                  ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
3698                                  ;*
3699                                  ;;**********************************************************************
3700  017362                          TST33:
3701  017362  000004                          SCOPE
3702  017364  012737  017634  001324          MOV     #TST34,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3703                                                                  ;FOR ESCAPE ON PARITY ERRORS
3704  017372  012737  023410  001200  20$:     MOV     #23410,$TMP4    ;LOAD EXPECTED ERROR CONDITION
3705  017400  005037  001274                  CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
3706  017404  012737  177777  177744          MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
3707  017412  013737  177746  001202          MOV     @#CONTRL,$TMP5  ;SAVE CONTROL REG TO RESTORE CACHE
3708  017420  012737  000014  177746          MOV     #14,@#CONTRL    ;FORCE MISSES IN CACHE
3709  017426  013737  001240  172354          MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MA  REG IN PAR6
3710  017434  012777  040000  161602          MOV     #40000,@LREGL   ;LOWEST MAP REGISTER POINTS TO 8K
3711  017442  005077  161600                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAP REG
3712  017446  012701  177750                  MOV     #MAINT,R1       ;PUT ADDR OF MAINT REG IN R1
3713  017452  012737  017510  001110          MOV     #1$,$LPERR      ;SET LOOP ON EROR POINTER TO 1$
```

```
3714  017460  005037  140000                    CLR     140000          ;CLEAR LOCATION 40000
3715  017464  012700  140002                    MOV     #140002,R0      ;LOAD ADDRESS OF 40002 INTO R0
3716  017470  012737  017510  001110            MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
3717  017476  012710  020001                    MOV     #20001,(R0)     ;LOAD ONE BIT IN EACH BYTE OF 40002
3718  017502  012737  017574  000114            MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
3719  017510  012737  140000  177750  1$:       MOV     #140000,@#MAINT ;FORCE ODD WORD PARITY BITS TO ONE
3720  017516  000240                            NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3721  017520  011003                            MOV     (R0),R3         ;'DATA FETCH'' SHOULD CAUSE PARITY ABORT
3722  017522  011102                            MOV     (R1),R2         ;SAVE MAINT REG IN CASE NO TRAP
3723  017524  005011                            CLR     (R1)            ;CLEAR MAINT REG IN CASE NO TRAP
3724  017526  050000                            BIS     R0,R0           ;DUMMY INST WITH P.B.'S ON
3725  017530  023737  001200  001274            CMP     $TMP4,PPARER    ;SEE IF MEM ERROR REG HOLDS RIGHT DATA
3726  017536  001401                            BEQ     2$              ;BRANCH IF ERROR WAS EXPECTED ONE
3727  017540  104044                            ERROR   44              ;PARITY REPORTING BAD
3728  017542  012737  177777  177744  2$:       MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
3729  017550  012737  005764  000114            MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
3730  017556  013737  001202  177746            MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
3731  017564  012737  017372  001110            MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3732  017572  000420                            BR      TST34           ;;TEST IS OVER, GO TO NEXT TEST
3733
3734
3735  017574  013737  177740  001270  10$:      MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
3736  017602  013737  177742  001272            MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
3737  017610  013737  177744  001274            MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
3738  017616  013737  177746  001276            MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
3739  017624  012737  140000  001300            MOV     #140000,PMAINT  ;SAVE DATA IN MAINTENENCE REGISTER
3740  017632  000002                            RTI                     ;RETURN TO TEST AND CHECK PARITY
3741
3742
3743                                    ;;**********************************************************************
3744                                    ;*TEST 34       PARITY REPORTING THRU THE MAP, CACHE DATA GROUP 0
3745                                    ;*
3746                                    ;*      THIS TEST FORCES A PARITY ERROR IN CACHE GROUP 0 AT PHYSICAL
3747                                    ;*      ADDRESS 00040010 BY SETTING BIT 15 IN THE WORD.  THE TEST
3748                                    ;*      THEN FORCES GROUP 0 LOW BYTE PARITY BIT TO ZERO AND EVEN
3749                                    ;*      WORD HIGH BYTE PARITY BIT TO ONE BEFORE READING ADDRESS 00040010
3750                                    ;*      THRU THE UNIBUS MAP.  THEN IT CHECKS TO SEE THAT THE PARITY
3751                                    ;*      ABORT OCCURRED AND THAT THE CONDITION WAS CORRECT BEFORE
3752                                    ;*      GOING TO THE NEXT TEST.
3753                                    ;*
3754                                    ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
3755                                    ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
3756                                    ;*
3757                                    ;;**********************************************************************
3758  017634                            TST34:
3759  017634  000004                            SCOPE
3760  017636  012737  020122  001324            MOV     #TST35,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3761                                                                    ;FOR ESCAPE ON PARITY ERRORS
3762  017644  012737  177777  020010  20$:      MOV     #-1,21$         ;RESTORE NEG ONE FOR NEXT ITERATION
3763  017652  032737  000004  177746            BIT     #BIT2,@#CONTRL  ;SEE IF GROUP 0 IS DISABLED
3764  017660  001120                            BNE     TST35           ;;BRANCH IF GROUP 0 IS DISABLED
3765  017662  013737  177746  001202            MOV     CONTRL,$TMP5    ;SAVE CONDITION OF CACHE
3766  017670  012737  023504  001200            MOV     #23504,$TMP4    ;EXPECTED PARITY CONDITION GROUP 0
3767  017676  005037  001274                    CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
3768  017702  012737  177777  177744            MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
3769  017710  013737  001240  172354            MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MAP REG IN PAR6
```

```
3770  017716  005077  161324            CLR     @LREGU          ;CLEAR UPPER BITS ON MAP REG
3771  017722  012777  040010  161314    MOV     #40010,@LREGL   ;LOAD LOWER 16 BITS OF MAP REG
3772  017730  012705  177750            MOV     #MAINT,R5       ;PUT ADDR OF MAINT REG IN R5
3773  017734  012704  140000            MOV     #140000,R4      ;SELECT PAR 6 BASE 0
3774  017740  012714  100000            MOV     #BIT15,(R4)     ;MAKE SURE I GET SOFT AND HARD ERRORS
3775                                                            ;BY LOADING 40000 WITH BIT 15, THIS
3776                                                            ;CAUSES THE HIGH BYTE P.B. TO BE ON
3777                                                            ;AND THE LOW BYTE TO BE OFF
3778  017744  012737  000030  177746    MOV     #30,@#CONTRL    ;FORCE SELECTION OF GROUP 0 ON READ
3779  017752  011401                    MOV     (R4),R1         ;PUT (40000) & (40002) IN GROUP 0
3780  017754  005001                    CLR     R1              ;ZERO R1 FOR THE MOMENT
3781  017756  012737  020062  000114    MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
3782  017764  010137  177750    1$:     MOV     R1,@#MAINT      ;FORCE GPO PARITY BITS TO 0 ON 2ND PASS
3783  017770  000241                    CLC                     ;THIS IS A SYNC POINT FOR SCOPING
3784                                                            ;THE LOW BYTE HAS ITS P.B. OFF
3785  017772  011401                    MOV     (R4),R1         ;DATA FETCH SHOULD CAUSE PARITY ABORT
3786  017774  011503                    MOV     (R5),R3         ;SAVE MAINT REG IN CASE NO TRAP
3787  017776  105015                    CLRB    (R5)            ;CLEAR MAINT REG IN CASE NO TRAP
3788  020000  006701                    SXT     R1              ;DUMMY INST WITH P.B.'S OFF
3789  020002  012701  020020            MOV     #020020,R1      ;FORCE GROUP 0 LOW BYTE PARITY BIT
3790                                                            ;TO 0 AND MAIN MEMORY EVEN WORD HIGH
3791                                                            ;BYTE PARITY BIT TO 1
3792  020006  005227                    INC     (PC)+           ;INCREMENT NEXT WORD TO ZERO ON FIRST PASS
3793  020010  177777            21$:    .WORD   -1              ;
3794  020012  001764                    BEQ     1$              ;BRANCH ON FIRST PASS ONLY
3795  020014  023737  001200  001274    CMP     $TMP4,PPARER    ;SEE IF ERROR CONDITION MATCHES EXPECTED
3796  020022  001402                    BEQ     2$              ;BRANCH IF CORRECT CONDITION
3797  020024  010302                    MOV     R3,R2           ;R2 HOLDS MAINT REG FOR ERROR TYPE OUT
3798  020026  104044                    ERROR   44              ;PARITY REPORTING BAD
3799  020030  012737  177777  177744    MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
3800  020036  012737  005764  000114    MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
3801  020044  013737  001202  177746    MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
3802  020052  012737  017644  001110    MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3803  020060  000420                    BR      TST35           ;;TEST OVER GO TO NEXT TEST
3804
3805
3806  020062  013737  177740  001270  10$:  MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
3807  020070  013737  177742  001272        MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
3808  020076  013737  177744  001274        MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
3809  020104  013737  177746  001276        MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
3810  020112  012737  030060  001300        MOV     #30060,PMAINT   ;SAVE DATA IN MAINTENENCE REGISTER
3811  020120  000002                        RTI                     ;RETURN TO TEST AND CHECK PARITY
3812
3813
3814                                ;;**************************************************************************
3815                                ;*TEST 35       PARITY REPORTING THRU THE MAP, CACHE DATA GROUP 1
3816                                ;*
3817                                ;*      THIS TEST FORCES A PARITY ERROR IN CACHE GROUP 1 AT PHYSICAL
3818                                ;*      ADDRESS 00040000 BY SETTING BIT 15 IN THE WORD.  THE TEST
3819                                ;*      THEN FORCES GROUP 1 LOW BYTE PARITY BIT TO ZERO AND EVEN
3820                                ;*      WORD HIGH BYTE PARITY BIT TO ONE BEFORE READING ADDRESS 00040000
3821                                ;*      THRU THE UNIBUS MAP.  THEN IT CHECKS TO SEE THAT THE PARITY
3822                                ;*      ABORT OCCURRED AND THAT THE CONDITION WAS CORRECT BEFORE
3823                                ;*      GOING TO THE NEXT TEST.
3824                                ;*
3825                                ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
```

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3826                                    ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
3827                                    ;*
3828                                    ;;*****************************************************************
3829  020122                            TST35:
3830  020122  000004                           SCOPE
3831  020124  012737  020466  001324           MOV     #TST36,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3832                                                                    ;FOR ESCAPE ON PARITY ERRORS
3833  020132  012737  177777  020276  20$:     MOV     #-1,21$         ;RESTORE NEG ONE FOR NEXT ITERATION
3834  020140  032737  000010  177746           BIT     #BIT3,CONTRL    ;SEE IF GROUP 1 IS DISABLED
3835  020146  001120                           BNE     UBMAP           ;;BRANCH TO NEXT TEST IF GROUP 1 DISABLED
3836  020150  013737  177746  001202           MOV     CONTRL,$TMP5    ;SAVE CONDITION OF CACHE
3837  020156  012737  023604  001200           MOV     #23604,$TMP4    ;EXPECTED PARITY CONDITION GROUP 1
3838  020164  005037  001274                   CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
3839  020170  012737  177777  177744           MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
3840  020176  013737  001240  172354           MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MAP REG IN PAR6
3841  020204  005077  161036                   CLR     @LREGU          ;CLEAR UPPER BITS ON MAP REG
3842  020210  012777  040000  161026           MOV     #40000,@LREGL   ;LOAD LOWER 16 BITS OF MAP REG
3843  020216  012705  177750                   MOV     #MAINT,R5       ;PUT ADDR OF MAINT REG IN R5
3844  020222  012704  140000                   MOV     #140000,R4      ;SELECT PAR 6 BASE 0
3845  020226  012714  100000                   MOV     #BIT15,(R4)     ;MAKE SURE I GET SOFT AND HARD ERRORS
3846                                                                    ;BY LOADING 40000 WITH BIT 15, THIS
3847                                                                    ;CAUSES THE HIGH BYTE P.B. TO BE ON
3848                                                                    ;AND THE LOW BYTE TO BE OFF
3849  020232  012737  000044  177746           MOV     #44,@#CONTRL    ;FORCE SELECTION OF GROUP 0 ON READ
3850  020240  011401                           MOV     (R4),R1         ;PUT (40000) & (40002) IN GROUP 1
3851  020242  005001                           CLR     R1              ;CLEAR R1 FOR MOMENT
3852  020244  012737  020350  000114           MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
3853  020252  010137  177750           1$:     MOV     R1,@#MAINT      ;FORCE GP1 PARITY BITS TO 0 ON 2ND PASS
3854  020256  000241                           CLC                     ;THIS IS A SYNC POINT FOR SCOPING
3855                                                                    ;THE LOW BYTE HAS ITS P.B. OFF
3856  020260  011401                           MOV     (R4),R1         ;DATA FETCH SHOULD CAUSE PARITY ABORT
3857  020262  011503                           MOV     (R5),R3         ;SAVE MAINT REG IN CASE NO TRAP
3858  020264  105015                           CLRB    (R5)            ;CLEAR MAINT REG IN CASE NO TRAP
3859  020266  006701                           SXT     R1              ;DUMMY INST WITH P.B.'S OFF
3860  020270  012701  020100                   MOV     #020100,R1      ;FORCE GROUP 1 LOW BYTE PARITY BIT
3861                                                                    ;TO 0 AND MAIN MEMORY EVEN WORD HIGH
3862                                                                    ;BYTE PARITY BIT TO 1
3863  020274  005227                           INC     (PC)+           ;INCREMENT NEXT WORD TO 0
3864  020276  177777                   21$:    .WORD   -1              ;
3865  020300  001764                           BEQ     1$              ;BRANCH ON FIRST PASS ONLY
3866  020302  023737  001200  001274           CMP     $TMP4,PPARER    ;SEE IF ERROR CONDITION MATCHES EXPECTED
3867  020310  001402                           BEQ     2$              ;BRANCH IF ERROR WAS EXPECTED ONE
3868  020312  010302                           MOV     R3,R2           ;R2 HOLDS MAINT REG FOR ERROR TYPE OUT
3869  020314  104044                           ERROR   44              ;PARITY REPORTING BAD
3870  020316  012737  177777  177744   2$:     MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
3871  020324  012737  005764  000114           MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
3872  020332  013737  001202  177746           MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
3873  020340  012737  020132  001110           MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3874  020346  000420                           BR      UBMAP           ;;TEST OVER GO TO NEXT TEST
3875
3876
3877  020350  013737  177740  001270   10$:    MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
3878  020356  013737  177742  001272           MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
3879  020364  013737  177744  001274           MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
3880  020372  013737  177746  001276           MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
3881  020400  012737  030300  001300           MOV     #30300,PMAINT   ;SAVE DATA IN MAINTENENCE REGISTER
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3882  020406  000002                        RTI                     ;RETURN TO TEST AND CHECK PARITY
3883
3884
3885
3886                                .SBTTL  ************************************************************************
3887                                .SBTTL  THE FOLLOWING TESTS ARE RUN THROUGH THE UNIBUS MAP
3888                                .SBTTL  ************************************************************************
3889
3890
3891  020410  000004                UBMAP:  SCOPE                   ;LOOP ON PREVIOUS TEST
3892  020412  104420                        TBITR                   ;RESTORE T-BIT IF IT WAS ON
3893                                ;*
3894                                ;*      THIS CODE SETS UP THE TWO MAP REGISTERS ABOVE THE LOWEST
3895                                ;*      USEABLE ONE TO POINT TO PHYSICAL MEMORY FROM 0 - 8K.  IN THE
3896                                ;*      DEFAULT CASE, IN MANUFACTURING AND IF THERE IS NO UNIBUS MEMORY,
3897                                ;*      THIS WILL BE MAP REGISTERS 1 AND 2.  MAP REGISTER 1 WILL POINT
3898                                ;*      TO PHYSICAL 4K - 8K SO "ACT-11" WILL WORK PROPERLY AND MAP
3899                                ;*      REGISTER 2 WILL POINT TO PHYSICAL 0 - 4K.  THIS MEANS THAT
3900                                ;*      KIPAR0 SHOULD GET 170400 SO IT PUTS ADDRESSES 040000 TO 057776
3901                                ;*      ON THE UNIBUS AND KIPAR1 SHOULD GET 170200 SO IT PUTS ADDRESSES
3902                                ;*      020000 TO 037776 ON THE UNIBUS.
3903                                ;*
3904  020414  013701  001246                MOV     LREGU,R1        ;PUT POINTER TO LOWEST MAP REG IN R1
3905  020420  005061  000004                CLR     4(R1)           ;CLEAR UPPER 6 BITS OF (LOWEST + 1)
3906  020424  005061  000010                CLR     10(R1)          ;CLEAR UPPER 6 BITS OF (LOWEST + 2)
3907  020430  012761  020000  000002        MOV     #20000,2(R1)    ;LOAD LOWER 16 BITS OF (LOWEST + 1)
3908                                                                ;SO THAT IT POINTS TO 4K - 8K
3909  020436  005061  000006                CLR     6(R1)           ;CLEAR LOWER 16 BITS OF (LOWEST + 2)
3910  020442  013701  001240                MOV     LOWEST,R1       ;PREPARE TO LOAD PAR1
3911  020446  062701  000200                ADD     #200,R1         ;POINTER TO (LOWEST + 1)
3912  020452  010137  172342                MOV     R1,KIPAR1       ;LOAD PAR1 TO POINT TO LOWEST + 1
3913  020456  062701  000200                ADD     #200,R1         ;ADJUST R1 FOR KIPAR0
3914  020462  010137  172340                MOV     R1,KIPAR0       ;LOAD PAR0 TO POINT TO (LOWEST + 2)
3915
3916
3917                                ;;*********************************************************************
3918                                ;*TEST 36       MAIN MEMORY TIMEOUT THRU MAP, CODE RUN OVER UNIBUS
3919                                ;*
3920                                ;*      THIS TEST GENERATES A TIME OUT THROUGH THE UNIBUS MAP BY TRYING
3921                                ;*      TO REFERENCE ADDRESS 17000000 IN MAIN MEMORY.  IT USES THE LOWEST
3922                                ;*      USEABLE MAP REGISTER, WHICH IN THE DEFAULT CASE IS MAP REGISTER
3923                                ;*      ZERO.
3924                                ;*
3925                                ;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THRU
3926                                ;*      THE UNIBUS MAP.
3927                                ;*
3928                                ;;*********************************************************************
3929  020466                        TST36:
3930  020466  000004                        SCOPE
3931  020470  012737  020526  001106        MOV     #20$,$LPADR     ;SET LOOP ON TEST POINTER TO 20$
3932  020476  012737  020526  001110        MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO 20$
3933  020504  012737  000036  001102        MOV     #36,$TSTNM      ;SETUP TEST NUMBER AND CLR ERROR FLAG
3934  020512  013737  001102  177570        MOV     $TSTNM,DISPLAY  ;DISPLAY TEST NUMBER FOR ALL TO SEE
3935  020520  012737  020622  001324        MOV     #TST37,NXTTST   ;SET UP ESCAPE VECTOR IN CASE OF PARITY ERRORS
3936  020526  012737  000020  001264  20$:  MOV     #20,CPUEXP      ;EXPECTING CPU TIMEOUT IN THIS TEST
3937  020534  013737  001240  172350        MOV     LOWEST,KIPAR4   ;LOAD PAR 4 WITH LOWEST USABLE MAP REG
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3938  020542  012777  000074  160476          MOV     #74,@LREGU      ;LOAD UPPER 6 BITS OF LOWEST MAP REG
3939  020550  012777  000000  160466          MOV     #000000,@LREGL  ;LOAD LOWER 16 BITS OF LOWEST MAP REG
3940  020556  012737  020564  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
3941  020564  005037  001266          1$:     CLR     PCPUER          ;CPU ERROR REG LOCATION
3942  020570  000240                          NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3943  020572  013703  100000                  MOV     @#100000,R3     ;TRY TO READ THRU PAGE 4
3944                                                                  ;THIS REFERENCE WILL GO OUT ON THE
3945                                                                  ;UNIBUS TO SELECT THE LOWEST USEABLE
3946                                                                  ;MAP REGISTER (DEFAULT MAP REG. 0).
3947                                                                  ;PHYSICAL ADDRESS 17700000 IS THEN
3948                                                                  ;GENERATED, WHICH SHOULD TIME OUT SINCE
3949                                                                  ;IT IS THE FIRST NON-EXISTANT LOCATION.
3950  020576  022737  000020  001266          CMP     #20,PCPUER      ;THE UNIBUS SHOULD HAVE TIMED OUT
3951  020604  001401                          BEQ     10$             ;BRANCH IF UNIBUS TIMED OUT
3952  020606  104045                          ERROR   45              ;DID NOT TIME OUT OVER UNIBUS
3953  020610  012737  020526  001110  10$:    MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
3954  020616  005037  001264                  CLR     CPUEXP          ;NO CPU TRAPS EXPECTED IN NEXT TEST
3955
3956
3957                                  ;;**********************************************************************
3958                                  ;*TEST 37       RELOCATION TEST USING LOWEST USABLE MAPPING REG
3959                                  ;*
3960                                  ;*      THIS TEST CHECKS OUT THE FULL ADDITION PROPERTIES OF THE UNIBUS
3961                                  ;*      MAP A.L.U..  IN THE DEFAULT CASE IT USES MAP REGISTER ZERO BUT
3962                                  ;*      IF THE MAP JUMPERS HAVE BEEN ALTERED TO DE-SELECT SOME MAP REGISTERS
3963                                  ;*      THIS TEST WILL USE THE LOWEST USEABLE MAP REGISTER.
3964                                  ;*      IF AN ERROR OCCURS THE TEST WILL REPORT THE PHYSICAL ADDRESS
3965                                  ;*      THAT WAS DESIRED, AND THE DATA AT THE ADDRESS THAT WAS REFERENCED.
3966                                  ;*
3967                                  ;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THRU
3968                                  ;*      THE UNIBUS MAP.
3969                                  ;*
3970                                  ;;**********************************************************************
3971  020622                          TST37:
3972  020622  000004                          SCOPE
3973  020624  012737  021536  001324          MOV     #TST40,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
3974                                                                  ;FOR ESCAPE ON PARITY ERRORS
3975  020632  012737  060000  060000          MOV     #060000,@#060000  ;MAKE SURE THAT ADDRESS 060000
3976                                                                  ;CONTAINS ITS OWN ADDRESS AS DATA
3977                                  ;;
3978                                  ;*THE RELOCATION HERE USES A BASE OF 00060000 AND AN
3979                                  ;*OFFSET OF 00000 TO PRODUCE AN ADDRESS OF 00060000
3980                                  ;;
3981  020640  012737  020672  001110  100$:   MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
3982  020646  005077  160374                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3983  020652  012777  060000  160364          MOV     #060000,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3984  020660  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
3985  020666  012700  140000                  MOV     #140000,R0      ;SELECT PAR6, OFFSET IS 00000
3986  020672  000240                  1$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
3987  020674  011001                          MOV     (R0),R1         ;READ LOCATION 060000 THRU THE UNIBUS
3988  020676  012702  060000                  MOV     #060000,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 060000
3989  020702  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
3990  020704  001401                          BEQ     2$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
3991  020706  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
3992                                  ;;
3993                                  ;*THE RELOCATION HERE USES A BASE OF 00052524 AND AN
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3994                                        ;*OFFSET OF 05252 TO PRODUCE AN ADDRESS OF 00057776
3995                                        ;;
3996  020710  012737  020742  001110  2$:   MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
3997  020716  005077  160324              CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
3998  020722  012777  052524  160314      MOV     #052524,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
3999  020730  013737  001240  172354      MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4000  020736  012700  145252              MOV     #145252,R0      ;SELECT PAR6, OFFSET IS 05252
4001  020742  000240              3$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4002  020744  011001                      MOV     (R0),R1         ;READ LOCATION 057776 THRU THE UNIBUS
4003  020746  012702  057776              MOV     #057776,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 057776
4004  020752  020102                      CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4005  020754  001401                      BEQ     4$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4006  020756  104046                      ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4007                                        ;;
4008                                        ;*THE RELOCATION HERE USES A BASE OF 00045252 AND AN
4009                                        ;*OFFSET OF 12524 TO PRODUCE AN ADDRESS OF 00057776
4010                                        ;;
4011  020760  012737  021012  001110  4$:   MOV     #5$,$LPERR      ;SET LOOP ON ERROR POINTER TO 5$
4012  020766  005077  160254              CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4013  020772  012777  045252  160244      MOV     #045252,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4014  021000  013737  001240  172354      MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4015  021006  012700  152524              MOV     #152524,R0      ;SELECT PAR6, OFFSET IS 12524
4016  021012  000240              5$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4017  021014  011001                      MOV     (R0),R1         ;READ LOCATION 057776 THRU THE UNIBUS
4018  021016  012702  057776              MOV     #057776,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 057776
4019  021022  020102                      CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4020  021024  001401                      BEQ     6$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4021  021026  104046                      ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4022                                        ;;
4023                                        ;*THE RELOCATION HERE USES A BASE OF 00050420 AND AN
4024                                        ;*OFFSET OF 10420 TO PRODUCE AN ADDRESS OF 00061040
4025                                        ;;
4026  021030  012737  021062  001110  6$:   MOV     #7$,$LPERR      ;SET LOOP ON ERROR POINTER TO 7$
4027  021036  005077  160204              CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4028  021042  012777  050420  160174      MOV     #050420,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4029  021050  013737  001240  172354      MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4030  021056  012700  150420              MOV     #150420,R0      ;SELECT PAR6, OFFSET IS 10420
4031  021062  000240              7$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4032  021064  011001                      MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4033  021066  012702  061040              MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4034  021072  020102                      CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4035  021074  001401                      BEQ     8$              ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4036  021076  104046                      ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4037                                        ;;
4038                                        ;*THE RELOCATION HERE USES A BASE OF 00054630 AND AN
4039                                        ;*OFFSET OF 04210 TO PRODUCE AN ADDRESS OF 00061040
4040                                        ;;
4041  021100  012737  021132  001110  8$:   MOV     #9$,$LPERR      ;SET LOOP ON ERROR POINTER TO 9$
4042  021106  005077  160134              CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4043  021112  012777  054630  160124      MOV     #054630,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4044  021120  013737  001240  172354      MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4045  021126  012700  144210              MOV     #144210,R0      ;SELECT PAR6, OFFSET IS 04210
4046  021132  000240              9$:     NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4047  021134  011001                      MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4048  021136  012702  061040              MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4049  021142  020102                      CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
```

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4050  021144  001401                          BEQ     10$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4051  021146  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4052                                  ;;
4053                                  ;*THE RELOCATION HERE USES A BASE OF 00044210 AND AN
4054                                  ;*OFFSET OF 14630 TO PRODUCE AN ADDRESS OF 00061040
4055                                  ;;
4056  021150  012737  021202  001110  10$:    MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
4057  021156  005077  160064                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4058  021162  012777  044210  160054          MOV     #044210,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4059  021170  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4060  021176  012700  154630                  MOV     #154630,R0      ;SELECT PAR6, OFFSET IS 14630
4061  021202  000240                  11$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4062  021204  011001                          MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4063  021206  012702  061040                  MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4064  021212  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4065  021214  001401                          BEQ     12$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4066  021216  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4067                                  ;;
4068                                  ;*THE RELOCATION HERE USES A BASE OF 00056734 AND AN
4069                                  ;*OFFSET OF 02104 TO PRODUCE AN ADDRESS OF 00061040
4070                                  ;;
4071  021220  012737  021252  001110  12$:    MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
4072  021226  005077  160014                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4073  021232  012777  056734  160004          MOV     #056734,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4074  021240  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4075  021246  012700  142104                  MOV     #142104,R0      ;SELECT PAR6, OFFSET IS 02104
4076  021252  000240                  13$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4077  021254  011001                          MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4078  021256  012702  061040                  MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4079  021262  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4080  021264  001401                          BEQ     14$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4081  021266  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4082                                  ;;
4083                                  ;*THE RELOCATION HERE USES A BASE OF 00042104 AND AN
4084                                  ;*OFFSET OF 16734 TO PRODUCE AN ADDRESS OF 00061040
4085                                  ;;
4086  021270  012737  021322  001110  14$:    MOV     #15$,$LPERR     ;SET LOOP ON ERROR POINTER TO 15$
4087  021276  005077  157744                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4088  021302  012777  042104  157734          MOV     #042104,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4089  021310  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4090  021316  012700  156734                  MOV     #156734,R0      ;SELECT PAR6, OFFSET IS 16734
4091  021322  000240                  15$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4092  021324  011001                          MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4093  021326  012702  061040                  MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4094  021332  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4095  021334  001401                          BEQ     16$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4096  021336  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4097                                  ;;
4098                                  ;*THE RELOCATION HERE USES A BASE OF 00057776 AND AN
4099                                  ;*OFFSET OF 01042 TO PRODUCE AN ADDRESS OF 00061040
4100                                  ;;
4101  021340  012737  021372  001110  16$:    MOV     #17$,$LPERR     ;SET LOOP ON ERROR POINTER TO 17$
4102  021346  005077  157674                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4103  021352  012777  057776  157664          MOV     #057776,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4104  021360  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4105  021366  012700  141042                  MOV     #141042,R0      ;SELECT PAR6, OFFSET IS 01042
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4106  021372  000240                  17$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4107  021374  011001                          MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4108  021376  012702  061040                  MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4109  021402  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4110  021404  001401                          BEQ     18$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4111  021406  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4112                                          ;;
4113                                          ;*THE RELOCATION HERE USES A BASE OF 00041042 AND AN
4114                                          ;*OFFSET OF 17776 TO PRODUCE AN ADDRESS OF 00061040
4115                                          ;;
4116  021410  012737  021442  001110  18$:    MOV     #19$,$LPERR     ;SET LOOP ON ERROR POINTER TO 19$
4117  021416  005077  157624                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4118  021422  012777  041042  157614          MOV     #041042,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4119  021430  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4120  021436  012700  157776                  MOV     #157776,R0      ;SELECT PAR6, OFFSET IS 17776
4121  021442  000240                  19$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4122  021444  011001                          MOV     (R0),R1         ;READ LOCATION 061040 THRU THE UNIBUS
4123  021446  012702  061040                  MOV     #061040,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 061040
4124  021452  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4125  021454  001401                          BEQ     20$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4126  021456  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4127                                          ;;
4128                                          ;*THE RELOCATION HERE USES A BASE OF 00057776 AND AN
4129                                          ;*OFFSET OF 00002 TO PRODUCE AN ADDRESS OF 00060000
4130                                          ;;
4131  021460  012737  021512  001110  20$:    MOV     #21$,$LPERR     ;SET LOOP ON ERROR POINTER TO 21$
4132  021466  005077  157554                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAPPING REG
4133  021472  012777  057776  157544          MOV     #057776,@LREGL  ;LOAD LOWER BITS OF MAPPING REG
4134  021500  013737  001240  172354          MOV     LOWEST,@#KIPAR6 ;LOAD PAR6 WITH ADDR OF LOWEST MAP REG
4135  021506  012700  140002                  MOV     #140002,R0      ;SELECT PAR6, OFFSET IS 00002
4136  021512  000240                  21$:    NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4137  021514  011001                          MOV     (R0),R1         ;READ LOCATION 060000 THRU THE UNIBUS
4138  021516  012702  060000                  MOV     #060000,R2      ;THE EXPECTED PHYSICAL ADDRESS IS 060000
4139  021522  020102                          CMP     R1,R2           ;SEE IF THE MAP'S FETCH WAS CORRECT
4140  021524  001401                          BEQ     22$             ;BRANCH IF FETCHED DATA MATCHES ADDRESS
4141  021526  104046                          ERROR   46              ;FAULTY RELOCATION BY UNIBUS MAP
4142  021530  012737  020640  001110  22$:    MOV     #100$,$LPERR    ;SET LOOP POINTER TO START OF TEST
4143
4144
4145
4146
4147                                          ;;**********************************************************************
4148                                          ;*TEST 40       TEST CARRY PROPAGATION OF MAP'S RELOCATION ADDER
4149                                          ;*
4150                                          ;*      EVERY ADDRESS OF THE FORM XXXX0000 IS GENERATED HERE STARTING
4151                                          ;*      WITH 00030000 UP TO 17000000.  THAT IS THE FIRST OF EVERY 2K
4152                                          ;*      WORDS IS ADDRESSED, TO INSURE THAT THE ADDER IN THE MAP IS
4153                                          ;*      WORKING PROPERLY AND, THE SYSTEM SIZE JUMPERS ARE ACTUALLY SET
4154                                          ;*      FOR THE TOP OF MAIN MEMORY.
4155                                          ;*
4156                                          ;;**********************************************************************
4157  021536                          TST40:
4158  021536  000004                          SCOPE
4159  021540  012737  022042  001324          MOV     #TST41,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
4160                                                                  ;FOR ESCAPE ON PARITY ERRORS
4161  021546  012737  000012  001204          MOV     #12,$TIMES      ;;DO 12 ITERATIONS
```

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4162  021554  012737  177777  021710  20$:    MOV     #-1,4$          ;INITIALIZE FLAG AS NEGATIVE ONE
4163  021562  005077  157460                  CLR     @LREGU          ;CLEAR UPPER 6 BITS OF MAP REG
4164  021566  012777  020000  157450          MOV     #20000,@LREGL   ;LOAD 4K BASE INTO MAP REGISTER
4165  021574  012701  100100                  MOV     #100100,R1      ;LOAD BITS TO SELECT PAR 4, OFFSET 100
4166  021600  012700  150000                  MOV     #150000,R0      ;LOAD BITS TO SELECT PAR 6, OFFSET 2K
4167  021604  012737  000277  172350          MOV     #277,KIPAR4     ;START WITH PHYSICAL 6K
4168  021612  013737  001240  172354          MOV     LOWEST,KIPAR6   ;LOAD PAR 6 WITH MAP REG'S ADDR
4169  021620  012737  021660  001110          MOV     #10$,$LPERR     ;SET LOOP ON ERROR POINTER TO 10$
4170  021626  012737  000020  001264  3$:     MOV     #TIMOUT,CPUEXP  ;EXPECTING A UNIBUS TIME OUT DURING TEST
4171  021634  005037  001266                  CLR     PCPUER          ;CLEAR TIME OUT FLAG
4172  021640  013710  001326                  MOV     DATA,(R0)       ;THIS LOAD WILL TIME OUT WHEN YOU
4173                                                                  ;HAVE REACHED THE TOP OF MEMORY
4174                                                                  ;IT SELECTS PAR 6 WHICH WILL PUT ADDR
4175                                                                  ;<XXX XX1>0000 ON THE UNIBUS.
4176                                                                  ;THE X'S WILL SELECT THE LOWEST USEABLE
4177                                                                  ;MAPPING REGISTER.  THE DEFAULT CASE IS
4178                                                                  ;010000,  SELECTING MAPPING REGISTER 0.
4179  021644  005737  001266                  TST     PCPUER          ;SEE IF THERE WAS MAIN MEMORY
4180  021650  001016                          BNE     1$              ;BRANCH IF NO MAIN MEMORY FROM UNIBUS
4181  021652  012737  000040  001264          MOV     #NEXMEM,CPUEXP  ;POSSIBLE CACHE NON-EXISTANT MEMORY
4182  021660  011103                  10$:    MOV     (R1),R3         ;READ TEST LOCATION VIA FASTBUS
4183  021662  022737  000040  001266          CMP     #NEXMEM,PCPUER  ;WAS THERE CACHE NON-EXISTANT MEMORY
4184  021670  001414                          BEQ     2$              ;BRANCH IF NON-EXISTANT MEMORY
4185  021672  000240                          NOP                     ;THIS IS A SYNC POINT FOR SCOPING
4186  021674  011002                          MOV     (R0),R2         ;READ TEST LOCATION VIA UNIBUS MAP
4187  021676  020203                          CMP     R2,R3           ;COMPARE TEST DATA R2=MAP DATA
4188                                                                  ;R3=FASTBUS DATA
4189  021700  001410                          BEQ     2$              ;BRANCH IF IT WAS THE SAME
4190  021702  104047                          ERROR   47              ;FAILURE IN CARRY PROPAGATION IN MAP
4191  021704  000406                          BR      2$              ;BRANCH TO UPDATE ROUTINE
4192  021706  005227                  1$:     INC     (PC)+           ;INCREMENT ONE TIME ENTRANCE FLAG
4193  021710  177777                  4$:     .WORD   -1              ;USE NEGATIVE ONE FOR FLAG
4194  021712  001003                          BNE     2$              ;BRANCH IF YOU'VE BEEN HERE BEFORE
4195  021714  013737  172350  001320          MOV     KIPAR4,RSIZE    ;SAVE UPPER LIMIT OF MEMORY
4196  021722  062737  000100  001326  2$:     ADD     #100,DATA       ;CHANGE PATTERN FOR NEXT LOAD
4197  021730  062737  000100  172350          ADD     #100,KIPAR4     ;ADD 2K TO PAR4
4198  021736  062777  010000  157300          ADD     #10000,@LREGL   ;ADD 2K TO MAP REGISTER
4199  021744  001330                          BNE     3$              ;BRANCH IF MAP REGISTER NOT ZERO
4200  021746  005277  157274                  INC     @LREGU          ;ADD ONE TO UPPER 6 BITS OF MAP REG
4201  021752  022777  000073  157266          CMP     #73,@LREGU      ;SEE IF TOP 128K BLOCK HAS BEEN PASSED
4202  021760  103322                          BHIS    3$              ;BRANCH IF NOT PAST IT
4203  021762  005237  001326                  INC     DATA            ;CHANGE DATA PATTERN FOR NEXT PASS
4204  021766  042737  177700  001326          BIC     #177700,DATA    ;CLEAR UPPER 10 BITS OF DATA PATTERN
4205  021774  052737  000300  001326          BIS     #300,DATA       ;START WITH 3XX IN DATA PATTERN
4206  022002  012737  021554  001110          MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
4207  022010  023737  177760  001320          CMP     @#SIZELO,RSIZE  ;SEE IF SIZE JUMPERS AGREE WITH MEMORY TOP
4208  022016  001407                          BEQ     19$             ;BRANCH IF TOP OF MEMORY AGREES WITH
4209                                                                  ;THE SIZE JUMPERS
4210  022020  105737  001331                  TSTB    KB11EM          ;RUNNING ON A KB11-EM?
4211  022024  001004                          BNE     19$             ;SKIP ERROR IF YES
4212  022026  105737  001332                  TSTB    KB11CM          ;RUNNING ON MODIFIED MACHINE?
4213  022032  001001                          BNE     19$             ;BRANCH IF YES
4214  022034  104050                          ERROR   50              ;MEMORY SIZE JUMPERS NOT RIGHT
4215  022036  005037  001264          19$:    CLR     CPUEXP          ;NO CPU TRAPS EXPECTED IN NEXT TEST
4216
4217
```

```
                                ;;*****************************************************************
                                ;*TEST 41       PARITY REPORTING THRU THE MAP, MAIN MEMORY EVEN WORD
                                ;*
                                ;*      THIS TEST FORCES A PARITY ERROR IN MAIN MEMORY AT PHYSICAL
                                ;*      ADDRESS 00040000 BY SETTING ONE BIT IN EACH BYTE OF THE
                                ;*      WORD.  THE TEST THEN FORCES THE EVEN WORD PARITY BITS TO
                                ;*      ONES AND READS ADDRESS 00040000 THRU THE UNIBUS MAP.  THEN
                                ;*      IT CHECKS TO SEE THAT THE PARITY ABORT OCCURRED AND THAT THE
                                ;*      CONDITION WAS CORRECT BEFORE GOING TO THE NEXT TEST.
                                ;*
                                ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
                                ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
                                ;*
                                ;;*****************************************************************
022042                          TST41:
                                        SCOPE
022044  012737  022304  001324          MOV     #TST42,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
022052  104416                          TBITO                   ;TURN OFF T BIT TRAPPING IF ON
022054  012737  023404  001200  20$:    MOV     #23404,$TMP4    ;EXPECTED ERROR CONDITION
022062  005037  001274                  CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
022066  012737  177777  177744          MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
022074  013737  177746  001202          MOV     @#CONTRL,$TMP5  ;SAVE CONTROL REG TO RESTORE CACHE
022102  012737  000014  177746          MOV     #14,@#CONTRL    ;FORCE MISSES IN CACHE
022110  013737  001240  172354          MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MAP REG IN PAR6
022116  012777  040000  157120          MOV     #40000,@LREGL   ;LOWEST MAP REGISTER POINTS TO 8K
022124  005077  157116                  CLR     @LREGU          ;CLEAR UPPER BITS OF MAP REG
022130  012701  177750                  MOV     #MAINT,R1       ;PUT ADDR OF MAINT REG IN R1
022134  012737  022152  001110          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
022142  012700  140000                  MOV     #140000,R0      ;SELECT KIPAR6, OFFSET 0
022146  012710  020001                  MOV     #20001,(R0)     ;LOAD ONE BIT IN EACH BYTE OF 40000
022152  012737  022244  000114  1$:     MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
022160  012737  030000  177750          MOV     #30000,@#MAINT  ;FORCE EVEN WORD PARITY BITS TO ONE
022166  000240                          NOP                     ;THIS IS A SYNC POINT FOR SCOPING
022170  011003                          MOV     (R0),R3         ;''DATA FETCH'' SHOULD CAUSE PARITY ABORT
022172  011102                          MOV     (R1),R2         ;SAVE MAINT REG IN CASE NO TRAP
022174  005011                          CLR     (R1)            ;CLEAR MAINT REG IN CASE NO TRAP
022176  050000                          BIS     R0,R0           ;DUMMY INST WITH P.B.'S ON
022200  023737  001200  001274          CMP     $TMP4,PPARER    ;SEE IF ERROR REG HOLDS RIGHT DATA
022206  001401                          BEQ     2$              ;BRANCH IF CONDITION WAS CORRECT
022210  104051                          ERROR   51              ;FAILURE IN PARITY REPORTING
022212  012737  177777  177744  2$:     MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
022220  012737  005764  000114          MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
022226  013737  001202  177746          MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
022234  012737  022054  001110          MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
022242  000420                          BR      TST42           ;;TEST OVER GO TO NEXT TEST


022244  013737  177740  001270  10$:    MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
022252  013737  177742  001272          MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
022260  013737  177744  001274          MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
022266  013737  177746  001276          MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
022274  012737  030000  001300          MOV     #30000,PMAINT   ;SAVE DATA IN MAINTENENCE REGISTER
022302  000002                          RTI                     ;RETURN TO TEST AND CHECK PARITY
```

```
                        ;;*****************************************************************
                        ;*TEST 42       PARITY REPORTING THRU THE MAP, MAIN MEMORY ODD WORD
                        ;*
                        ;*      THIS TEST FORCES A PARITY ERROR IN MAIN MEMORY AT PHYSICAL
                        ;*      ADDRESS 00040002 BY SETTING ONE BIT IN EACH BYTE OF THE
                        ;*      WORD.  THE TEST THEN FORCES THE ODD WORD PARITY BITS TO
                        ;*      ONES AND READS ADDRESS 00040002 THRU THE UNIBUS MAP.  THEN
                        ;*      IT CHECKS TO SEE THAT THE PARITY ABORT OCCURRED AND THAT THE
                        ;*      CONDITION WAS CORRECT BEFORE GOING TO THE NEXT TEST.
                        ;*
                        ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
                        ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
                        ;*
                        ;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THRU
                        ;*      THE UNIBUS MAP.
                        ;*
                        ;;*****************************************************************
022304                  TST42:
022304  000004                  SCOPE
022306  012737  022556  001324        MOV     #TST43,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
022314  012737  023410  001200  20$:   MOV     #23410,$TMP4    ;LOAD EXPECTED ERROR CONDITION
022322  005037  001274          CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
022326  012737  177777  177744        MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
022334  013737  177746  001202        MOV     @#CONTRL,$TMP5  ;SAVE CONTROL REG TO RESTORE CACHE
022342  012737  000014  177746        MOV     #14,@#CONTRL    ;FORCE MISSES IN CACHE
022350  013737  001240  172354        MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MAP REG IN PAR6
022356  012777  040000  156660        MOV     #40000,@LREGL   ;LOWEST MAP REGISTER POINTS TO 8K
022364  005077  156656          CLR     @LREGU          ;CLEAR UPPER BITS OF MAP REG
022370  012701  177750          MOV     #MAINT,R1       ;PUT ADDR OF MAINT REG IN R1
022374  012737  022424  001110        MOV     #1$,$LPERR      ;SET LOOP ON EROR POINTER TO 1$
022402  005037  140000          CLR     140000          ;CLEAR LOCATION 40000
022406  012700  140002          MOV     #140002,R0      ;LOAD ADDRESS OF 40002 INTO R0
022412  012737  022424  001110        MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
022420  012710  020001          MOV     #20001,(R0)     ;LOAD ONE BIT IN EACH BYTE OF 40002
022424  012737  022516  000114  1$:   MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
022432  012737  140000  177750        MOV     #140000,@#MAINT ;FORCE ODD WORD PARITY BITS TO ONE
022440  000240                      NOP                     ;THIS IS A SYNC POINT FOR SCOPING
022442  011003                      MOV     (R0),R3         ;''DATA FETCH'' SHOULD CAUSE PARITY ABORT
022444  011102                      MOV     (R1),R2         ;SAVE MAINT REG IN CASE NO TRAP
022446  005011                      CLR     (R1)            ;CLEAR MAINT REG IN CASE NO TRAP
022450  050000                      BIS     R0,R0           ;DUMMY INST WITH P.B.'S ON
022452  023737  001200  001274        CMP     $TMP4,PPARER    ;SEE IF MEM ERROR REG HOLDS RIGHT DATA
022460  001401                      BEQ     2$              ;BRANCH IF ERROR WAS EXPECTED ONE
022462  104051                      ERROR   51              ;FAILURE IN PARITY REPORTING
022464  012737  177777  177744  2$:   MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
022472  012737  005764  000114        MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
022500  013737  001202  177746        MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
022506  012737  022314  001110        MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
022514  000420                      BR      TST43           ;;TEST IS OVER, GO TO NEXT TEST


022516  013737  177740  001270  10$:   MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
022524  013737  177742  001272        MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
022532  013737  177744  001274        MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
```

```
                        MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
                        MOV     #140000,PMAINT  ;SAVE DATA IN MAINTENENCE REGISTER
                        RTI                     ;RETURN TO TEST AND CHECK PARITY


                ;;*****************************************************************
                ;*TEST 43        PARITY REPORTING THRU THE MAP, CACHE DATA GROUP 0
                ;*
                ;*      THIS TEST FORCES A PARITY ERROR IN CACHE GROUP 0 AT PHYSICAL
                ;*      ADDRESS 00040000 BY SETTING BIT 15 IN THE WORD.  THE TEST
                ;*      THEN FORCES GROUP 0 LOW BYTE PARITY BIT TO ZERO AND EVEN
                ;*      WORD HIGH BYTE PARITY BIT TO ONE BEFORE READING ADDRESS 00040000
                ;*      THRU THE UNIBUS MAP.  THEN IT CHECKS TO SEE THAT THE PARITY
                ;*      ABORT OCCURRED AND THAT THE CONDITION WAS CORRECT BEFORE
                ;*      GOING TO THE NEXT TEST.
                ;*
                ;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
                ;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
                ;*
                ;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THRU
                ;*      THE UNIBUS MAP.
                ;*
                ;;*****************************************************************
022556          TST43:
                        SCOPE
022556  000004
022560  012737  023044  001324          MOV     #TST44,NXTTST   ;SAVE STARTING ADDRESS OF NEXT TEST
                                                                ;FOR ESCAPE ON PARITY ERRORS
022566  012737  177777  022732  20$:    MOV     #-1,21$         ;RESTORE NEG ONE FOR NEXT ITERATION
022574  032737  000004  177746          BIT     #BIT2,@#CONTRL  ;SEE IF GROUP 0 IS DISABLED
022602  001120                          BNE     TST44           ;;BRANCH IF GROUP 0 IS DISABLED
022604  013737  177746  001202          MOV     CONTRL,$TMP5    ;SAVE CONDITION OF CACHE
022612  012737  023504  001200          MOV     #23504,$TMP4    ;EXPECTED PARITY CONDITION GROUP 0
022620  005037  001274                  CLR     PPARER          ;CLEAR MEM ERROR REG STORAGE
022624  012737  177777  177744          MOV     #-1,@#MEMERR    ;CLEAR MEMORY ERROR REGISTER
022632  013737  001240  172354          MOV     LOWEST,KIPAR6   ;PUT UNIBUS ADDR OF MAP REG IN PAR6
022640  005077  156402                  CLR     @LREGU          ;CLEAR UPPER BITS ON MAP REG
022644  012777  040000  156372          MOV     #40000,@LREGL   ;LOAD LOWER 16 BITS OF MAP REG
022652  012705  177750                  MOV     #MAINT,R5       ;PUT ADDR OF MAINT REG IN R5
022656  012704  140000                  MOV     #140000,R4      ;SELECT PAR 6 BASE 0
022662  012714  100000                  MOV     #BIT15,(R4)     ;MAKE SURE I GET SOFT AND HARD ERRORS
                                                                ;BY LOADING 40000 WITH BIT 15, THIS
                                                                ;CAUSES THE HIGH BYTE P.B. TO BE ON
                                                                ;AND THE LOW BYTE P.B. TO BE OFF
022666  012737  000030  177746          MOV     #30,@#CONTRL    ;FORCE SELECTION OF GROUP 0 ON READ
022674  011401                          MOV     (R4),R1         ;PUT (40000) & (40002) IN GROUP 0
022676  005001                          CLR     R1              ;ZERO R1 FOR THE MOMENT
022700  012737  023004  000114          MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
022706  010137  177750          1$:     MOV     R1,@#MAINT      ;FORCE GP0 PARITY BITS TO 0 ON 2ND PASS
022712  000241                          CLC                     ;THIS IS A SYNC POINT FOR SCOPING
                                                                ;THE LOW BYTE HAS ITS P.B. OFF
022714  011401                          MOV     (R4),R1         ;DATA FETCH SHOULD CAUSE PARITY ABORT
022716  011503                          MOV     (R5),R3         ;SAVE MAINT REG IN CASE NO TRAP
022720  105015                          CLRB    (R5)            ;CLEAR MAINT REG IN CASE NO TRAP
022722  006701                          SXT     R1              ;DUMMY INST WITH P.B.'S OFF
022724  012701  020020                  MOV     #020020,R1      ;FORCE GROUP 0 LOW BYTE PARITY BIT
                                                                ;TO 0 AND MAIN MEMORY EVEN WORD HIGH
```

```
                                                        ;BYTE PARITY BIT TO 1
                        INC     (PC)+                   ;INCREMENT NEXT WORD TO ZERO ON FIRST PASS
                21$:    .WORD   -1                      ;
                        BEQ     1$                      ;BRANCH ON FIRST PASS ONLY
                        CMP     $TMP4,PPARER            ;SEE IF ERROR CONDITION MATCHES EXPECTED
                        BEQ     2$                      ;BRANCH IF CORRECT CONDITION
                        MOV     R3,R2                   ;R2 HOLDS MAINT REG FOR ERROR TYPE OUT
                        ERROR   51                      ;FAILURE IN PARITY REPORTING
                2$:     MOV     #-1,MEMERR              ;CLEAR MEMORY ERROR REGISTER
                        MOV     #MEMER,CACHVEC          ;RESTORE PARITY SERVICE ROUTINE
                        MOV     $TMP5,CONTRL            ;RESTORE CACHE TO FORMER CONDITION
                        MOV     #20$,$LPERR             ;SET LOOP POINTER TO START OF TEST
                        BR      TST44                   ;;TEST OVER GO TO NEXT TEST

                10$:    MOV     @#LOADRS,PLOADR         ;SAVE LOWER CACHE ADDR REG
                        MOV     @#HIADRS,PHIADR         ;SAVE HIGH BITS OF FAILING ADDR
                        MOV     @#MEMERR,PPARER         ;SAVE MEMORY ERROR REGISTER
                        MOV     @#CONTRL,PCONTR         ;SAVE CONTROL REGISTER FOR TYPE OUT
                        MOV     #30060,PMAINT           ;SAVE DATA IN MAINTENENCE REGISTER
                        RTI                             ;RETURN TO TEST AND CHECK PARITY


;;*********************************************************************
;*TEST 44        PARITY REPORTING THRU THE MAP, CACHE DATA GROUP 1
;*
;*      THIS TEST FORCES A PARITY ERROR IN CACHE GROUP 1 AT PHYSICAL
;*      ADDRESS 00040000 BY SETTING BIT 15 IN THE WORD.  THE TEST
;*      THEN FORCES GROUP 1 LOW BYTE PARITY BIT TO ZERO AND EVEN
;*      WORD HIGH BYTE PARITY BIT TO ONE BEFORE READING ADDRESS 00040000
;*      THRU THE UNIBUS MAP.  THEN IT CHECKS TO SEE THAT THE PARITY
;*      ABORT OCCURRED AND THAT THE CONDITION WAS CORRECT BEFORE
;*      GOING TO THE NEXT TEST.
;*
;*      ERRORS ARE REPORTED INLINE IN THE TEST CODE, AND THE PARITY
;*      VECTOR WILL TRAP TO LABEL 10$ AT THE END OF THIS TEST.
;*
;*      THIS TEST IS BEING RUN WITH ALL MEMORY REFERENCES GOING THRU
;*      THE UNIBUS MAP.
;*
;;*********************************************************************
TST44:  SCOPE
                        MOV     #TST45,NXTTST           ;SET UP ESCAPE POINTER IN CASE OF
                                                        ;RANDOM PARITY ABORTS
                20$:    MOV     #-1,21$                 ;RESTORE NEG ONE FOR NEXT ITERATION
                        BIT     #BIT3,CONTRL            ;SEE IF GROUP 1 IS DISABLED
                        BNE     TST45                   ;;BRANCH TO NEXT TEST IF GROUP 1 DISABLED
                        MOV     CONTRL,$TMP5            ;SAVE CONDITION OF CACHE
                        MOV     #23604,$TMP4            ;EXPECTED PARITY CONDITION GROUP 1
                        CLR     PPARER                  ;CLEAR MEM ERROR REG STORAGE
                        MOV     #-1,@#MEMERR            ;CLEAR MEMORY ERROR REGISTER
                        MOV     LOWEST,KIPAR6           ;PUT UNIBUS ADDR OF MAP REG IN PAR6
                        CLR     @LREGU                  ;CLEAR UPPER BITS ON MAP REG
                        MOV     #40000,@LREGL           ;LOAD LOWER 16 BITS OF MAP REG
                        MOV     #MAINT,R5               ;PUT ADDR OF MAINT REG IN R5
                        MOV     #140000,R4              ;SELECT PAR 6 BASE 0
```

```
4442  023150  012714  100000              MOV     #BIT15,(R4)     ;MAKE SURE I GET SOFT AND HARD ERRORS
4443                                                              ;BY LOADING 40000 WITH BIT 15, THIS
4444                                                              ;CAUSES THE HIGH BYTE P.B. TO BE ON
4445                                                              ;AND THE LOW BYTE P.B. TO BE OFF
4446  023154  012737  000044  177746        MOV     #44,@#CONTRL    ;FORCE SELECTION OF GROUP 0 ON READ
4447  023162  011401                        MOV     (R4),R1         ;PUT (40000) & (40002) IN GROUP 1
4448  023164  005001                        CLR     R1              ;CLEAR R1 FOR MOMENT
4449  023166  012737  023272  000114        MOV     #10$,CACHVEC    ;SET PARITY VECTOR TO 10$
4450  023174  010137  177750        1$:     MOV     R1,@#MAINT      ;FORCE GP1 PARITY BITS TO 0 ON 2ND PASS
4451  023200  000241                        CLC                     ;THIS IS A SYNC POINT FOR SCOPING
4452                                                              ;THE LOW BYTE HAS ITS P.B. OFF
4453  023202  011401                        MOV     (R4),R1         ;DATA FETCH SHOULD CAUSE PARITY ABORT
4454  023204  011503                        MOV     (R5),R3         ;SAVE MAINT REG IN CASE NO TRAP
4455  023206  105015                        CLRB    (R5)            ;CLEAR MAINT REG IN CASE NO TRAP
4456  023210  006701                        SXT     R1              ;DUMMY INST WITH P.B.'S OFF
4457  023212  012701  020100                MOV     #020100,R1      ;FORCE GROUP 1 LOW BYTE PARITY BIT
4458                                                              ;TO 0 AND MAIN MEMORY EVEN WORD HIGH
4459                                                              ;BYTE PARITY BIT TO 1
4460  023216  005227                        INC     (PC)+           ;INCREMENT NEXT WORD TO 0
4461  023220  177777                21$:    .WORD   -1              ;
4462  023222  001764                        BEQ     1$              ;BRANCH ON FIRST PASS ONLY
4463  023224  023737  001200  001274        CMP     $TMP4,PPARER    ;SEE IF ERROR CONDITION MATCHES EXPECTED
4464  023232  001402                        BEQ     2$              ;BRANCH IF ERROR WAS EXPECTED ONE
4465  023234  010302                        MOV     R3,R2           ;R2 HOLDS MAINT REG FOR ERROR TYPE OUT
4466  023236  104051                        ERROR   51              ;FAILURE IN PARITY REPORTING
4467  023240  012737  177777  177744  2$:   MOV     #-1,MEMERR      ;CLEAR MEMORY ERROR REGISTER
4468  023246  012737  005764  000114        MOV     #MEMER,CACHVEC  ;RESTORE PARITY SERVICE ROUTINE
4469  023254  013737  001202  177746        MOV     $TMP5,CONTRL    ;RESTORE CACHE TO FORMER CONDITION
4470  023262  012737  023054  001110        MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
4471  023270  000420                        BR      TST45           ;;TEST OVER GO TO NEXT TEST
4472
4473
4474  023272  013737  177740  001270  10$:   MOV     @#LOADRS,PLOADR ;SAVE LOWER CACHE ADDR REG
4475  023300  013737  177742  001272        MOV     @#HIADRS,PHIADR ;SAVE HIGH BITS OF FAILING ADDR
4476  023306  013737  177744  001274        MOV     @#MEMERR,PPARER ;SAVE MEMORY ERROR REGISTER
4477  023314  013737  177746  001276        MOV     @#CONTRL,PCONTR ;SAVE CONTROL REGISTER FOR TYPE OUT
4478  023322  012737  030300  001300        MOV     #30300,PMAINT   ;SAVE DATA IN MAINTENENCE REGISTER
4479  023330  000002                        RTI                     ;RETURN TO TEST AND CHECK PARITY
4480
4481
4482                                ;;**************************************************************
4483                                ;*TEST 45        CHECK BYP BITS IN UBMR
4484                                ;* THIS TEST IS EXECUTED ONLY ON KB11-EM OR 11/74          (KB11CM)
4485                                ;*
4486                                ;;**************************************************************
4487  023332  000004                TST45:  SCOPE
4488  023334  012737  023466  001324        MOV     #TST46,NXTTST
4489  023342  105737  001331               TSTB    KB11EM          ;IS THIS A KB11-EM?
4490  023346  001003                       BNE     10$             ;BR IF YES
4491  023350  105737  001332               TSTB    KB11CM          ;IS THIS A MODIFIED PROCESSOR?
4492  023354  001444                       BEQ     5$
4493  023356  012700  170202        10$:    MOV     #170202,R0
4494  023362  005010                4$:     CLR     (R0)
4495  023364  032710  100000               BIT     #BYP,(R0)
4496  023370  001405                       BEQ     1$
4497  023372  010037  001154               MOV     R0,$REG0
```

```
 4498  023376  011037  001156                MOV     (R0),$REG1
 4499  023402  104053                        ERROR   53
 4500
 4501  023404  052710  100000        1$:     BIS     #BYP,(R0)
 4502  023410  032710  100000                BIT     #BYP,(R0)
 4503  023414  001005                        BNE     2$
 4504  023416  010037  001154                MOV     R0,$REG0
 4505  023422  011037  001156                MOV     (R0),$REG1
 4506  023426  104054                        ERROR   54
 4507
 4508  023430  042710  100000        2$:     BIC     #BYP,(R0)
 4509  023434  032710  100000                BIT     #BYP,(R0)
 4510  023440  001405                        BEQ     3$
 4511  023442  010037  001154                MOV     R0,$REG0
 4512  023446  011037  001156                MOV     (R0),$REG1
 4513  023452  104053                        ERROR   53
```

```
 4514
 4515  023454  062700  000004          3$:     ADD     #4,R0
 4516  023460  020027  170366                  CMP     R0,#170366
 4517  023464  001336                          BNE     4$
 4518  023466                          5$:
 4519
 4520
 4521                                  ;;*******************************************************************
 4522                                  ;*TEST 46       CHECK FOR PRESENCE OF MKA11 REGS. ON KB11-EM OR KB11CM
 4523                                  ;* THIS TEST IS EXECUTED ONLY ON KB11-EM OR 11/74          (KB11CM)
 4524                                  ;*
 4525                                  ;;*******************************************************************
 4526  023466  000004                  TST46:  SCOPE
```

```
4527  023470  012737  023626  001324          MOV     #TST47,NXTTST
4528          172100                          MKCSR=172100
4529
4530          177744                          MSER= 177744
4531  023476  105737  001331                  TSTB    KB11EM          ;KB11-EM?
4532  023502  001003                          BNE     1$              ;BR IF YES
4533  023504  105737  001332                  TSTB    KB11CM          ;MODIFIED CPU?
4534  023510  001446                          BEQ     99$             ;NO, SKIP THIS TEST
4535  023512  012702  172100          1$:     MOV     #MKCSR, R2      ;POINT TO CSR REGISTERS.
4536  023516  013746  000004                  MOV     @#4, -(SP)      ;SAVE OLD CPU ERROR VEC
4537  023522  012737  023546  000004          MOV     #66$, @#4       ;REPLACE WITH TEST ROUTINE
4538
4539  023530  005712                  2$:     TST     (R2)            ;TRY TO ACCESS CSR
4540  023532  062702  000002                  ADD     #2,R2           ;INCREMENT R2 BY 2
4541  023536  020227  172140          4$:     CMP     R2,#172140      ;ALL REGISTERS TESTED?
4542  023542  103772                          BLO     2$              ;NOPE, TEST SOMEMORE
4543  023544  000426                          BR      98$             ;TEST IS OVER.
4544                                  ;;***   TRAP HANDLER            ***
4545  023546  012705  001000          66$:    MOV     #1000,R5        ;SET COUNTER AND...
4546  023552  077501                          SOB     R5,.            ;WAIT A WHILE FOR THE GATES TO SETTLE
4547  023554  005737  177744                  TST     @#MSER          ;ANY BITS SET IN MEM. ERR. REG?
4548  023560  001004                          BNE     68$             ;YES, ERROR
4549  023562  032737  000020  177766          BIT     #BIT4,@#CPUERR  ;UNIBUS ERROR BIT SET?
4550  023570  001011                          BNE     77$             ;YES,OK
4551  023572  010237  001160          68$:    MOV     R2, $REG2       ;PRINT OFFENDING CSR
4552  023576  013737  177744  001172          MOV     @#MSER,$TMP1    ;       MSER
4553  023604  013737  177766  001174          MOV     @#CPUERR,$TMP2  ;       CPUERR
4554  023612  104055                          ERROR   55              ;REPORT ERROR
4555  023614  005037  177766          77$:    CLR     @#CPUERR        ;CLEAR THE ERROR REGISTER
4556  023620  000002                          RTI
4557                                  ;;**********************************
4558
4559  023622  012637  000004          98$:    MOV     (SP)+, @#4      ;RESTORE CPU ERROR VECTOR
4560
4561  023626                          99$:
4562                                  ;;=====================================================================
4563                                  ;*TEST 47       CHECK CACHE BYPASS ON UNIBUS MAP PAGE
4564                                          ;THIS TEST CHECKS CACHE BYPASS ON UNIBUS-MAP-PAGE
4565                                          ;THIS TEST IS EXECUTED ONLY ON KB11-EM OR 11/74          (KB11CM)
4566                                          ;THIS TEST USES MEMORY MANAGMENT
4567                                  ;;=====================================================================
4568  023626  000004                  TST47:  SCOPE
4569  023630  012737  000005  001204          MOV     #5,$TIMES       ;;DO 5 ITERATIONS
4570
4571  023636  013746  177776                  MOV     @#PS,-(SP)
4572  023642  042716  000020                  BIC     #20,(SP)        ;CLEAR T BIT IF SET
4573  023646  012746  023654                  MOV     #1$,-(SP)
4574  023652  000002                          RTI
4575  023654                          1$:
4576
4577  023654  012737  024346  001324          MOV     #$EOP,NXTTST
4578  023662  105737  001331                  TSTB    KB11EM          ;IS THIS A KB11-EM?
4579  023666  001005                          BNE     CBMP            ;BR IF YES
4580  023670  105737  001332                  TSTB    KB11CM
4581  023674  001002                          BNE     CBMP
4582  023676  000137  024346                  JMP     $EOP
```

```
4583  023702  012737  170000  172354  CBMP:   MOV     #170000,@#KIPAR6        ;MAP TO UNIBUS MAPPING BOX
4584  023710  012737  010406  172314          MOV     #10406,@#KIPDR6         ;THROUGH PAGE 6
4585
4586  023716  012705  170200                  MOV     #MAPL00,R5              ;STARTING ADDRESS OF UBMR'S
4587
4588  023722  005037  177746          CBMPA:  CLR     @#CONTRL
4589  023726  032737  010000  177746    1$:   BIT     #VCIP,@#CONTRL
4590  023734  001374                          BNE     1$
4591
4592  023736  012700  023702                  MOV     #CBMP,R0                ;MAKE TEST CODE HIT IN GROUP 0
4593  023742  012702  001000                  MOV     #1000,R2
4594  023746  012737  000054  177746    2$:   MOV     #S1MOM1,@#CONTRL
4595  023754  005760  002000                  TST     2000(R0)
4596  023760  012737  000034  177746          MOV     #S0MOM1,@#CONTRL
4597  023766  005720                          TST     (R0)+
4598  023770  077212                          SOB     R2,2$           ;DONE?
4599
4600  023772  012700  040050                  MOV     #TSTDAT,R0              ;MAKE TEST DATA HIT IN GROUP 1
4601  023776  012702  001000                  MOV     #1000,R2
4602  024002  012737  000040  177746          MOV     #S1,@#CONTRL
4603  024010  005720                  9$:     TST     (R0)+
4604  024012  077202                          SOB     R2,9$
4605
4606  024014  012737  177600  172356          MOV     #177600,@#KIPAR7        ;MAP I/O PAGE THROUGH PAGE 7
4607  024022  012737  077406  172316          MOV     #77406,@#KIPDR7
4608  024030  005037  172340                  CLR     @#KIPAR0                ;MAP 0-4 K VIRTUAL INTO
4609  024034  012737  077406  172300          MOV     #77406,@#KIPDR0         ;0-4 K PHYSICAL ADDRESS FORCE
4610  024042  012737  000200  172342          MOV     #200,@#KIPAR1           ;MAP 4-8K VIRTUAL INTO 4-8K
4611  024050  012737  077406  172302          MOV     #77406,@#KIPDR1         ;PHYSICAL ADDRESS SPACE
4612  024056  012737  000400  172344          MOV     #400,@#KIPAR2
4613  024064  012737  077406  172304          MOV     #77406,@#KIPDR2
4614
4615  024072  012700  040050                  MOV     #TSTDAT,R0              ;SET UP UNIBUS MAPPING
4616  024076  042700  000077                  BIC     #77,R0                  ;REGISTER. NOTE THIS REGISTER
4617  024102  010025                          MOV     R0,(R5)+                ;WILL BE USED FOR CACHE-
4618  024104  005015                          CLR     (R5)                    ;BYPASS ON UNIBUS MAP PAGE.
4619
4620  024106  012700  040050                  MOV     #TSTDAT,R0              ;FORM THE VIRTUAL ADDRESS FOR
4621  024112  042700  177700                  BIC     #177700,R0              ;THAT DATA.  NOTE TEST DATA
4622  024116  052700  140000                  BIS     #140000,R0              ;IS MAPPED THROUGH PAR6
4623  024122  010001                          MOV     R0,R1                   ;R0 CONTAINS THE VA
4624  024124  012702  001000                  MOV     #1000,R2
4625
4626  024130  012737  000060  172516          MOV     #60,@#MMR3              ;ENABLE 22-BIT MAPPING
4627  024136  012737  000001  177572          MOV     #1,@#MMR0               ;TURN ON KT AND UNIBUS MAP
4628
4629  024144  005710                  3$:     TST     (R0)                    ;REFERENCE TEST-DATA,CHECK IT
4630  024146  032737  000010  177752          BIT     #10,@#HITMIS            ;IS A HIT
4631  024154  001011                          BNE     4$
4632  024156  013737  177746  001154          MOV     @#CONTRL,$REG0
4633  024164  012737  000001  001156          MOV     #1,$REG1                ;GROUP NO, BEING TESTED
4634  024172  010037  001160                  MOV     R0,$REG2                ;TEST-DATA ADDRESS
4635  024176  104056                          ERROR   56                      ;TEST DATA REFERENCE NOT
4636                                                                          ;A HIT, AS EXPECTED. IT WAS
4637                                                                          ;MADE BIT IN GROUP 1,
4638                                                                          ;PREVIOUSLY. THEN IT WAS
```

```
                                                        ;REFERENCE THROUGH THE UNIBUS
                                                        ;MAP-

024200  062700  000002          4$:   ADD     #2,R0
024204  077221                  SOB     R2,3$           ;DONE?

024206  052715  100000          BIS     #BYP,(R5)       ;GET BYPASS IN (HI) UNIBUS
                                                        ;MAP REGISTER BEING CHECKED
024212  012702  001000          MOV     #1000,R2
024216  010100                  MOV     R1,R0           ;R0 CONTAINS THE VA OF TEST-DATA
024220  005711                  5$:   TST     (R1)      ;REFERENCE TEST DATA THROUGH
                                                        ;THE UNIBUS MAP (WITH CACHE
                                                        ;BYPASS SET) AND CHECK
                                                        ;IF THE REFERENCE WAS A MISS

024222  062701  000002          6$:   ADD     #2,R1
024226  077204                  SOB     R2,5$           ;DONE?

024230  005037  177572          CLR     @#MMR0          ;TURN OFF MEM MNGMNT
024234  005037  172516          CLR     @#MMR3
024240  042715  100000          BIC     #BYP,(R5)       ;CLEAR CACHE BYPASS IN UBMR
024244  012700  040050          MOV     #TSTDAT,R0
024250  012702  000400          MOV     #400,R2
024254  005710                  7$:   TST     (R0)      ;REFERENCE TEST-DATA AGAIN
                                                        ;AND CHECK THAT IT WAS
                                                        ;INVALIDATED PREVIOUSLY
024256  032737  000010  177752  BIT     #10,@#HITMIS    ;MISS?
024264  001413                  BEQ     8$              ;YES
024266  013737  177746  001154  MOV     @#CONTRL,$REG0
024274  010537  001156          MOV     R5,$REG1        ;ADDRESS OF UB MAP REGISTER THAT
024300  162737  000002  001156  SUB     #2,$REG1        ;IS BEING TESTED
024306  010037  001160          MOV     R0,$REG2        ;TEST-DATA ADDRESS
024312  104057                  ERROR   57              ;TEST DATA REFERENCE WAS NOT
                                                        ;A MISS.  TEST-DATA WAS
                                                        ;PREVIOUSLY REFERENCED IN
                                                        ;BYPASS (ON UBMR) MODE,HENCE
                                                        ;IT SHOULD HAVE BEEN
                                                        ;INVALIDATED.  BUT, SUBSEQUENT
                                                        ;REFERENCE WAS NOT A MISS,
                                                        ;AS EXPECTED

024314  062700  000004          8$:   ADD     #4,R0
024320  077223                  SOB     R2,7$           ;DONE?
024322  020527  170366          CMP     R5,#MAPH35      ;DONE CHECKING ALL 31 UBMR'S?
024326  001407                  BEQ     10$

024330  062705  000002          ADD     #2,R5           ;ADDRESS OF NEXT UBMR
024334  062737  000200  172354  ADD     #200,@#KIPAR6   ;MAP  PAR 6 TO RESET THE
024342  000137  023722          JMP     CBMPA           ;NEXT UBMR (TO BE TESTED)
024346                  10$:

                        ;;**************************************************************

                        .SBTTL  END OF PASS ROUTINE

                        ;*INCREMENT THE PASS NUMBER ($PASS)
```

```
                                        ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
                                        ;*TYPE 'END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT YYYYY''
                                        ;*WHERE XXXXX AND YYYYY ARE DECIMAL NUMBERS
                                        ;*IF SW12=1 INHIBIT TRACE TRAP
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO LOOP

024346                                  $EOP:
024346  000004                                SCOPE                   ;LOOP ON LAST TEST
024350  005037  177572                        CLR     MMR0            ;TURN OFF FULL RELOCATION
024354  005037  172516                        CLR     MMR3            ;DISABLE THE UNIBUS MAP
024360  104420                               TBITR                   ;RESTORE THE T BIT IF IT WAS ON
024362  005037  001102                        CLR     $TSTNM          ;;ZERO THE TEST NUMBER
024366  005037  001204                        CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
024372  005237  001100                        INC     $PASS           ;;INCREMENT THE PASS NUMBER
024376  042737  100000  001100                BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
024404  005327                               DEC     (PC)+           ;;LOOP?
024406  000001                        $EOPCT: .WORD   1
024410  003072                               BGT     $DOAGN          ;;YES
024412  012737                               MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
024414  000001                        $ENDCT: .WORD   1
024416  024406                                $EOPCT
024420  104400  024426                        TYPE    ,65$            ;;TYPE ASCIZ STRING
024424  000407                               BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <12><15>/END PASS #/
024444                                  64$:
024444  013746  001100                        MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                                                        ;;TYPE PASS NUMBER
024450  104410                               TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
024452  104400  024460                        TYPE    ,67$            ;;TYPE ASCIZ STRING
024456  000421                               BR      66$             ;;GET OVER THE ASCIZ
                                        ;;67$:  .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
024522                                  66$:
024522  013746  001112                        MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
                                                                        ;;TOTAL NUMBER OF ERRORS
024526  104410                               TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
024530  104400  001215                        TYPE    ,$CRLF          ;;TYPE CARRIAGE RETURN, LINE FEED
024534  005037  001112                        CLR     $ERTTL          ;;CLEAR ERROR TOTAL
024540  013700  000042                $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
024544  001414                               BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
024546  005046                               CLR     -(SP)           ;;INSURE THE 'T'' BIT IS CLEAR
024550  012746  024556                        MOV     #$CLR.T,-(SP)   ;;SETUP FOR AN RTI OR RTT
024554  000427                               BR      $RTRN           ;;GO DO AN RTI OR RTT TO LOAD THE PSW
                                                                        ;;WITH A CLEARED 'T'' BIT
024556                                  $CLR.T:
024556  013700  000042                        MOV     @#42,R0         ;;INSURE R0 CONTAINS THE MONITORS
024562  001405                               BEQ     $DOAGN          ;;RETURN ADDRESS
024564  000005                               RESET                   ;;CLEAR THE WORLD
024566  004710                        $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
024570  000240                               NOP                     ;;SAVE ROOM
024572  000240                               NOP                     ;;FOR
024574  000240                               NOP                     ;;ACT11
024576                                  $DOAGN:
024576  013746  177776                        MOV     @#PS,-(SP)      ;;PUT THE PS ON THE STACK AND
024602  042716  000020                        BIC     #20,(SP)        ;;CLEAR THE 'T'' BIT
024606  032737  010000  177570                BIT     #BIT12,@#SWR    ;;RUN WITH TRACE TRAP?
```

```
                                                BNE     1$              ;;BR IF NO
                                                COM     $TBIT           ;;IS IT TIME FOR TRACE TRAP
                                                BMI     1$              ;;BR IF NO
                                                BIS     #20,(SP)        ;;SET TRACE TRAP
                                        1$:     MOV     #$LOOP,-(SP)    ;;JUMP TO START OF TEST
                                        $RTRN:  RTI                     ;;RETURN--THIS IS CHANGED TO
                                                                        ;;AN 'RTT' IF 'RTT' IS A LEGAL
                                                                        ;;INSTRUCTION
                                        $LOOP:
                                                JMP     @#LOOP          ;;RETURN
                                        $TBIT:  .WORD   0               ;;'T' BIT STATE INDICATOR
                                        $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
                                                .EVEN

                                        ;MESSAGES
                                        MSG1:   .ASCIZ<CRLF>    'CPU UNDER TEST FOUND TO BE A '

                                        MSG2:   .ASCIZ  'KB11-EM'<CRLF>

                                        MSG3:   .ASCIZ  'KB11-B/C'<CRLF>

                                        MSG4:   .ASCIZ  'KB11-CM                '<CRLF>

                                        MSG5:   .ASCIZ  'KB11-E'<CRLF>


                                                .SBTTL  ERROR MESSAGES AND DATA TABLES
                                        EM1:    .ASCIZ  ?NOT THE CORRECT TRAP CONDITION THRU ERRVEC (#004)?

                                        EM2:    .ASCIZ  ?UNEXPECTED CPU TRAP THRU ERRVEC (#004)?

                                        EM3:    .ASCIZ  ?UNEXPECTED CACHE PARITY ERROR THRU CACHVEC, WILL RETRY TEST ONCE?
```

```
 4807  025162  044124  052522  041440
 4808  025170  041501  053110  041505
 4809  025176  020054  044527  046114
 4810  025204  051040  052105  054522
 4811  025212  052040  051505  020124
 4812  025220  047117  042503     000
 4813  025225     125  042516  050130  EM4:    .ASCIZ  ?UNEXPECTED MAIN MEMORY PARITY ERROR THRU CACHVEC, WILL RETRY TEST ONCE?
 4814  025232  041505  042524  020104
 4815  025240  040515  047111  046440
 4816  025246  046505  051117  020131
 4817  025254  040520  044522  054524
 4818  025262  042440  051122  051117
 4819  025270  052040  051110  020125
 4820  025276  040503  044103  042526
 4821  025304  026103  053440  046111
 4822  025312  020114  042522  051124
 4823  025320  020131  042524  052123
 4824  025326  047440  041516  000105
 4825  025334  047125  054105  042520  EM5:    .ASCIZ  ?UNEXPECTED MEMORY MANAGEMENT TRAP, MEMORY MANAGEMENT STATUS REGISTERS?
 4826  025342  052103  042105  046440
 4827  025350  046505  051117  020131
 4828  025356  040515  040516  042507
 4829  025364  042515  052116  052040
 4830  025372  040522  026120  046440
 4831  025400  046505  051117  020131
 4832  025406  040515  040516  042507
 4833  025414  042515  052116  051440
 4834  025422  040524  052524  020123
 4835  025430  042522  044507  052123
 4836  025436  051105  000123
 4837  025442  052523  046515  051101  EM6:    .ASCIZ  ?SUMMARY OF MAP REGISTERS THAT TIMED OUT ON READ?
 4838  025450  020131  043117  046440
 4839  025456  050101  051040  043505
 4840  025464  051511  042524  051522
 4841  025472  052040  040510  020124
 4842  025500  044524  042515  020104
 4843  025506  052517  020124  047117
 4844  025514  051040  040505  000104
 4845  025522  052523  046515  051101  EM7:    .ASCIZ  ?SUMMARY OF CACHE REGISTERS THAT TIMED OUT ON READ?
 4846  025530  020131  043117  041440
 4847  025536  041501  042510  051040
 4848  025544  043505  051511  042524
 4849  025552  051522  052040  040510
 4850  025560  020124  044524  042515
 4851  025566  020104  052517  020124
 4852  025574  047117  051040  040505
 4853  025602  000104
 4854  025604  052523  046515  051101  EM10:   .ASCIZ  ?SUMMARY OF MAP REGISTERS NOT HOLDING ZERO IN LOW 16 BITS?
 4855  025612  020131  043117  046440
 4856  025620  050101  051040  043505
 4857  025626  051511  042524  051522
 4858  025634  047040  052117  044040
 4859  025642  046117  044504  043516
 4860  025650  055040  051105  020117
 4861  025656  047111  046040  053517
 4862  025664  030440  020066  044502
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 4863  025672  051524     000
 4864  025675     123  046525  040515  EM11:   .ASCIZ  ?SUMMARY OF MAP REGISTERS NOT HOLDING ZERO IN UPPER 6 BITS?
 4865  025702  054522  047440  020106
 4866  025710  040515  020120  042522
 4867  025716  044507  052123  051105
 4868  025724  020123  047516  020124
 4869  025732  047510  042114  047111
 4870  025740  020107  042532  047522
 4871  025746  044440  020116  050125
 4872  025754  042520  020122  020066
 4873  025762  044502  051524     000
 4874  025767     120  051517  044523  EM12:   .ASCIZ  ?POSSIBLE ERROR IN MAP REGISTER DATA PATH (MAP REG 00)?
 4875  025774  046102  020105  051105
 4876  026002  047522  020122  047111
 4877  026010  046440  050101  051040
 4878  026016  043505  051511  042524
 4879  026024  020122  040504  040524
 4880  026032  050040  052101  020110
 4881  026040  046450  050101  051040
 4882  026046  043505  030040  024460
 4883  026054     000
 4884  026055     116  053517  050040  EM13:   .ASCIZ  ?NOW PROBABLE ERROR IN MAP REGISTER DATA PATH (MAP REG 20)?
 4885  026062  047522  040502  046102
 4886  026070  020105  051105  047522
 4887  026076  020122  047111  046440
 4888  026104  050101  051040  043505
 4889  026112  051511  042524  020122
 4890  026120  040504  040524  050040
 4891  026126  052101  020110  046450
 4892  026134  050101  051040  043505
 4893  026142  031040  024460     000
 4894  026147     123  046525  040515  EM14:   .ASCIZ  ?SUMMARY OF DUAL ADDRESSING ERRORS ON LOADING MAP REGISTERS?
 4895  026154  054522  047440  020106
 4896  026162  052504  046101  040440
 4897  026170  042104  042522  051523
 4898  026176  047111  020107  051105
 4899  026204  047522  051522  047440
 4900  026212  020116  047514  042101
 4901  026220  047111  020107  040515
 4902  026226  020120  042522  044507
 4903  026234  052123  051105  000123
 4904  026242  052523  046515  051101  EM15:   .ASCIZ  ?SUMMARY OF COUNT PATTERN FAILURES IN LOWER 16 BITS OF MAP REGISTERS?
 4905  026250  020131  043117  041440
 4906  026256  052517  052116  050040
 4907  026264  052101  042524  047122
 4908  026272  043040  044501  052514
 4909  026300  042522  020123  047111
 4910  026306  046040  053517  051105
 4911  026314  030440  020066  044502
 4912  026322  051524  047440  020106
 4913  026330  040515  020120  042522
 4914  026336  044507  052123  051105
 4915  026344  000123
 4916  026346  052523  046515  051101  EM16:   .ASCIZ  ?SUMMARY OF COUNT PATTERN FAILURES IN UPPER 6 BITS OF MAP REGISTERS?
 4917  026354  020131  043117  041440
 4918  026362  052517  052116  050040
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 4919  026370  052101  042524  047122
 4920  026376  043040  044501  052514
 4921  026404  042522  020123  047111
 4922  026412  052440  050120  051105
 4923  026420  033040  041040  052111
 4924  026426  020123  043117  046440
 4925  026434  050101  051040  043505
 4926  026442  051511  042524  051522
 4927  026450     000
 4928  026451     103  052517  042114  EM17:   .ASCII  ?COULD NOT CLEAR CACHE CONTROL REGISTER?<CRLF>
 4929  026456  047040  052117  041440
 4930  026464  042514  051101  041440
 4931  026472  041501  042510  041440
 4932  026500  047117  051124  046117
 4933  026506  051040  043505  051511
 4934  026514  042524  100122
 4935  026520  047520  051523  041111          .ASCIZ  ?POSSIBLE ERROR IN CACHE REGISTER DATA PATH?
 4936  026526  042514  042440  051122
 4937  026534  051117  044440  020116
 4938  026542  040503  044103  020105
 4939  026550  042522  044507  052123
 4940  026556  051105  042040  052101
 4941  026564  020101  040520  044124
 4942  026572     000
 4943  026573     103  052517  042114  EM20:   .ASCII  ?COULD NOT CLEAR CACHE MAINTENENCE REGISTER?<CRLF>
 4944  026600  047040  052117  041440
 4945  026606  042514  051101  041440
 4946  026614  041501  042510  046440
 4947  026622  044501  052116  047105
 4948  026630  047105  042503  051040
 4949  026636  043505  051511  042524
 4950  026644  100122
 4951  026646  047520  051523  041111          .ASCIZ  ?POSSIBLE ERROR IN CACHE REGISTER DATA PATH?
 4952  026654  042514  042440  051122
 4953  026662  051117  044440  020116
 4954  026670  040503  044103  020105
 4955  026676  042522  044507  052123
 4956  026704  051105  042040  052101
 4957  026712  020101  040520  044124
 4958  026720     000
 4959  026721     103  052517  042114  EM21:   .ASCII  ?COULD NOT READ 177740 FROM CACHE LO ADDRESS REG (LOADRS)?<CRLF>
 4960  026726  047040  052117  051040
 4961  026734  040505  020104  033461
 4962  026742  033467  030064  043040
 4963  026750  047522  020115  040503
 4964  026756  044103  020105  047514
 4965  026764  040440  042104  042522
 4966  026772  051523  051040  043505
 4967  027000  024040  047514  042101
 4968  027006  051522  100051
 4969  027012  047520  051523  041111          .ASCIZ  ?POSSIBLE ERROR IN CACHE REGISTER DATA PATH?
 4970  027020  042514  042440  051122
 4971  027026  051117  044440  020116
 4972  027034  040503  044103  020105
 4973  027042  042522  044507  052123
 4974  027050  051105  042040  052101
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 4975  027056  020101  040520  044124
 4976  027064     000
 4977  027065     103  052517  042114  EM22:   .ASCII  ?COULD NOT READ 000003 FROM CACHE HI ADDRESS REG (HIADRS)?<CRLF>
 4978  027072  047040  052117  051040
 4979  027100  040505  020104  030060
 4980  027106  030060  031460  043040
 4981  027114  047522  020115  040503
 4982  027122  044103  020105  044510
 4983  027130  040440  042104  042522
 4984  027136  051523  051040  043505
 4985  027144  024040  044510  042101
 4986  027152  051522  100051
 4987  027156  047520  051523  041111          .ASCIZ  ?POSSIBLE ERROR IN CACHE REGISTER DATA PATH?
 4988  027164  042514  042440  051122
 4989  027172  051117  044440  020116
 4990  027200  040503  044103  020105
 4991  027206  042522  044507  052123
 4992  027214  051105  042040  052101
 4993  027222  020101  040520  044124
 4994  027230     000
 4995  027231     123  046525  040515  EM23:   .ASCIZ  ?SUMMARY OF COUNT PATTERN FAILURES IN CACHE CONTROL REGISTER?
 4996  027236  054522  047440  020106
 4997  027244  047503  047125  020124
 4998  027252  040520  052124  051105
 4999  027260  020116  040506  046111
 5000  027266  051125  051505  044440
 5001  027274  020116  040503  044103
 5002  027302  020105  047503  052116
 5003  027310  047522  020114  042522
 5004  027316  044507  052123  051105
 5005  027324     000
 5006  027325     123  046525  040515  EM24:   .ASCIZ  ?SUMMARY OF COUNT PATTERN FAILURES IN CACHE MAINTENENCE REGISTER?
 5007  027332  054522  047440  020106
 5008  027340  047503  047125  020124
 5009  027346  040520  052124  051105
 5010  027354  020116  040506  046111
 5011  027362  051125  051505  044440
 5012  027370  020116  040503  044103
 5013  027376  020105  040515  047111
 5014  027404  042524  042516  041516
 5015  027412  020105  042522  044507
 5016  027420  052123  051105     000
 5017  027425     122  043105  051105  EM25:   .ASCIZ  ?REFERENCED MAP REGISTER 0 WITH ADDRESS ONE BIT DIFFERENT THAN 770200?
 5018  027432  047105  042503  020104
 5019  027440  040515  020120  042522
 5020  027446  044507  052123  051105
 5021  027454  030040  053440  052111
 5022  027462  020110  042101  051104
 5023  027470  051505  020123  047117
 5024  027476  020105  044502  020124
 5025  027504  044504  043106  051105
 5026  027512  047105  020124  044124
 5027  027520  047101  033440  030067
 5028  027526  030062  000060
 5029  027532  042522  042506  042522  EM26:   .ASCII  ?REFERENCED CACHE LOW ADDRESS REGISTER WITH ADDRESS ONE BIT?<CRLF>
 5030  027540  041516  042105  041440
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 5031  027546  041501  042510  046040
 5032  027554  053517  040440  042104
 5033  027562  042522  051523  051040
 5034  027570  043505  051511  042524
 5035  027576  020122  044527  044124
 5036  027604  040440  042104  042522
 5037  027612  051523  047440  042516
 5038  027620  041040  052111     200
 5039  027625     104  043111  042506          .ASCIZ  ?DIFFERENT THAN 777740?
 5040  027632  042522  052116  052040
 5041  027640  040510  020116  033467
 5042  027646  033467  030064     000
 5043  027653     103  047101  052047  EM30:   .ASCII  ?CAN'T GET TO MAIN MEMORY FROM UNIBUS WITH THE MAP OFF?<CRLF>
 5044  027660  043440  052105  052040
 5045  027666  020117  040515  047111
 5046  027674  046440  046505  051117
 5047  027702  020131  051106  046517
 5048  027710  052440  044516  052502
 5049  027716  020123  044527  044124
 5050  027724  052040  042510  046440
 5051  027732  050101  047440  043106
 5052  027740     200
 5053  027741     123  020117  023511          .ASCIZ  ?SO I'LL JUMP TO THE SIZE JUMPER TEST FOR VERIFICATION?
 5054  027746  046114  045040  046525
 5055  027754  020120  047524  052040
 5056  027762  042510  051440  055111
 5057  027770  020105  052512  050115
 5058  027776  051105  052040  051505
 5059  030004  020124  047506  020122
 5060  030012  042526  044522  044506
 5061  030020  040503  044524  047117
 5062  030026     000
 5063  030027     123  046525  040515  EM31:   .ASCIZ  ?SUMMARY OF COUNT PATTERN FAILURES ON THE UNIBUS DATA PATH?
 5064  030034  054522  047440  020106
 5065  030042  047503  047125  020124
 5066  030050  040520  052124  051105
 5067  030056  020116  040506  046111
 5068  030064  051125  051505  047440
 5069  030072  020116  044124  020105
 5070  030100  047125  041111  051525
 5071  030106  042040  052101  020101
 5072  030114  040520  044124     000
 5073  030121     125  044516  052502  EM32:   .ASCIZ  ?UNIBUS MAP IS RELOCATING WHEN NOT ENABLED?
 5074  030126  020123  040515  020120
 5075  030134  051511  051040  046105
 5076  030142  041517  052101  047111
 5077  030150  020107  044127  047105
 5078  030156  047040  052117  042440
 5079  030164  040516  046102  042105
 5080  030172     000
 5081  030173     103  047101  047516  EM33:   .ASCII  ?CANNOT USE ANY OF THE MAP REGISTERS, OR PHYSICAL?<CRLF>
 5082  030200  020124  051525  020105
 5083  030206  047101  020131  043117
 5084  030214  052040  042510  046440
 5085  030222  050101  051040  043505
 5086  030230  051511  042524  051522
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 5087  030236  020054  051117  050040
 5088  030244  054510  044523  040503
 5089  030252  100114
 5090  030254  042101  051104  051505          .ASCIZ  ?ADDRESS BIT14 IS STUCK LOW. MUST RESTART PROGRAM IF NO LOOP?
 5091  030262  020123  044502  030524
 5092  030270  020064  051511  051440
 5093  030276  052524  045503  046040
 5094  030304  053517  020056  052515
 5095  030312  052123  051040  051505
 5096  030320  040524  052122  050040
 5097  030326  047522  051107  046501
 5098  030334  044440  020106  047516
 5099  030342  046040  047517  000120
 5100  030350  044124  020105  052516  EM34:   .ASCII  ?THE NUMBER OF MAP REGISTERS REMOVED BY JUMPER SETTING DOES?<CRLF>
 5101  030356  041115  051105  047440
 5102  030364  020106  040515  020120
 5103  030372  042522  044507  052123
 5104  030400  051105  020123  042522
 5105  030406  047515  042526  020104
 5106  030414  054502  045040  046525
 5107  030422  042520  020122  042523
 5108  030430  052124  047111  020107
 5109  030436  047504  051505     200
 5110  030443     116  052117  040440          .ASCIZ  ?NOT AGREE WITH THE NUMBER FOUND TO BE MISSING?
 5111  030450  051107  042505  053440
 5112  030456  052111  020110  044124
 5113  030464  020105  052516  041115
 5114  030472  051105  043040  052517
 5115  030500  042116  052040  020117
 5116  030506  042502  046440  051511
 5117  030514  044523  043516     000
 5118  030521     124  042510  051440  EM35:   .ASCII  ?THE SIZE JUMPERS ON THE UNIBUS MAP ARE NOT SET IN?<CRLF>
 5119  030526  055111  020105  052512
 5120  030534  050115  051105  020123
 5121  030542  047117  052040  042510
 5122  030550  052440  044516  052502
 5123  030556  020123  040515  020120
 5124  030564  051101  020105  047516
 5125  030572  020124  042523  020124
 5126  030600  047111     200
 5127  030603     124  042510  051111          .ASCII  ?THEIR DEFAULT POSITION, WHICH ALLOWS UNIBUS ADDRESSES?<CRLF>
 5128  030610  042040  043105  052501
 5129  030616  052114  050040  051517
 5130  030624  052111  047511  026116
 5131  030632  053440  044510  044103
 5132  030640  040440  046114  053517
 5133  030646  020123  047125  041111
 5134  030654  051525  040440  042104
 5135  030662  042522  051523  051505
 5136  030670     200
 5137  030671     060  030060  030060          .ASCII  ?000000 TO 757776 TO REFERENCE MAIN MEMORY?<CRLF>
 5138  030676  020060  047524  033440
 5139  030704  033465  033467  020066
 5140  030712  047524  051040  043105
 5141  030720  051105  047105  042503
 5142  030726  046440  044501  020116
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5143  030734  042515  047515  054522
5144  030742     200
5145  030743     124  042510  051111          .ASCIZ  ?THEIR CURRENT SETTING ALLOWS ONLY:?
5146  030750  041440  051125  042522
5147  030756  052116  051440  052105
5148  030764  044524  043516  040440
5149  030772  046114  053517  020123
5150  031000  047117  054514  000072
5151  031006  040515  020120  042522  EM36:   .ASCIZ  ?MAP REGISTER UNDER TEST DID NOT RESPOND IN DUAL MAPPING TEST?
5152  031014  044507  052123  051105
5153  031022  052440  042116  051105
5154  031030  052040  051505  020124
5155  031036  044504  020104  047516
5156  031044  020124  042522  050123
5157  031052  047117  020104  047111
5158  031060  042040  040525  020114
5159  031066  040515  050120  047111
5160  031074  020107  042524  052123
5161  031102     000
5162  031103     123  046525  040515  EM37:   .ASCIZ  ?SUMMARY OF UNIBUS ADDRESS ERRORS, WITH THE MAP RELOCATION DISABLED?
5163  031110  054522  047440  020106
5164  031116  047125  041111  051525
5165  031124  040440  042104  042522
5166  031132  051523  042440  051122
5167  031140  051117  026123  053440
5168  031146  052111  020110  044124
5169  031154  020105  040515  020120
5170  031162  042522  047514  040503
5171  031170  044524  047117  042040
5172  031176  051511  041101  042514
5173  031204  000104
5174  031206  040515  047111  046440  EM40:   .ASCIZ  ?MAIN MEMORY TIMEOUT OVER THE UNIBUS DID NOT OCCUR PROPERLY?
5175  031214  046505  051117  020131
5176  031222  044524  042515  052517
5177  031230  020124  053117  051105
5178  031236  052040  042510  052440
5179  031244  044516  052502  020123
5180  031252  044504  020104  047516
5181  031260  020124  041517  052503
5182  031266  020122  051120  050117
5183  031274  051105  054514     000
5184  031301     122  046105  041517  EM41:   .ASCIZ  ?RELOCATION THRU THE MAP WAS NOT CORRECT, FULL ADD?
5185  031306  052101  047511  020116
5186  031314  044124  052522  052040
5187  031322  042510  046440  050101
5188  031330  053440  051501  047040
5189  031336  052117  041440  051117
5190  031344  042522  052103  020054
5191  031352  052506  046114  040440
5192  031360  042104     000
5193  031363     122  046105  041517  EM42:   .ASCIZ  ?RELOCATION THRU THE MAP WAS NOT CORRECT, CARRY PROPAGATION?
5194  031370  052101  047511  020116
5195  031376  044124  052522  052040
5196  031404  042510  046440  050101
5197  031412  053440  051501  047040
5198  031420  052117  041440  051117
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 5199  031426  042522  052103  020054
 5200  031434  040503  051122  020131
 5201  031442  051120  050117  043501
 5202  031450  052101  047511  000116
 5203  031456  044124  020105  047524  EM43:   .ASCIZ  ?THE TOP OF MEMORY IS DIFFERENT THAN THE SIZE JUMPERS?
 5204  031464  020120  043117  046440
 5205  031472  046505  051117  020131
 5206  031500  051511  042040  043111
 5207  031506  042506  042522  052116
 5208  031514  052040  040510  020116
 5209  031522  044124  020105  044523
 5210  031530  042532  045040  046525
 5211  031536  042520  051522     000
 5212  031543     120  051101  052111  EM44:   .ASCIZ  ?PARITY REPORTING THRU THE MAP IS NOT CORRECT?
 5213  031550  020131  042522  047520
 5214  031556  052122  047111  020107
 5215  031564  044124  052522  052040
 5216  031572  042510  046440  050101
 5217  031600  044440  020123  047516
 5218  031606  020124  047503  051122
 5219  031614  041505  000124
 5220  031620  040515  047111  046440  EM45:   .ASCII  ?MAIN MEMORY TIMEOUT OVER THE UNIBUS DID NOT OCCUR PROPERLY?<CRLF>
 5221  031626  046505  051117  020131
 5222  031634  044524  042515  052517
 5223  031642  020124  053117  051105
 5224  031650  052040  042510  052440
 5225  031656  044516  052502  020123
 5226  031664  044504  020104  047516
 5227  031672  020124  041517  052503
 5228  031700  020122  051120  050117
 5229  031706  051105  054514     200
 5230  031713     124  051505  020124          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
 5231  031720  047503  042504  041040
 5232  031726  044505  043516  051040
 5233  031734  047125  047440  042526
 5234  031742  020122  047125  041111
 5235  031750  051525     000
 5236  031753     122  046105  041517  EM46:   .ASCII  ?RELOCATION THRU THE MAP WAS NOT CORRECT, FULL ADD?<CRLF>
 5237  031760  052101  047511  020116
 5238  031766  044124  052522  052040
 5239  031774  042510  046440  050101
 5240  032002  053440  051501  047040
 5241  032010  052117  041440  051117
 5242  032016  042522  052103  020054
 5243  032024  052506  046114  040440
 5244  032032  042104     200
 5245  032035     124  051505  020124          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
 5246  032042  047503  042504  041040
 5247  032050  044505  043516  051040
 5248  032056  047125  047440  042526
 5249  032064  020122  047125  041111
 5250  032072  051525     000
 5251  032075     122  046105  041517  EM47:   .ASCII  ?RELOCATION THRU THE MAP WAS NOT CORRECT, CARRY PROPAGATION?<CRLF>
 5252  032102  052101  047511  020116
 5253  032110  044124  052522  052040
 5254  032116  042510  046440  050101
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 5255  032124  053440  051501  047040
 5256  032132  052117  041440  051117
 5257  032140  042522  052103  020054
 5258  032146  040503  051122  020131
 5259  032154  051120  050117  043501
 5260  032162  052101  047511  100116
 5261  032170  042524  052123  041440          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
 5262  032176  042117  020105  042502
 5263  032204  047111  020107  052522
 5264  032212  020116  053117  051105
 5265  032220  052440  044516  052502
 5266  032226  000123
 5267  032230  044124  020105  047524  EM50:   .ASCII  ?THE TOP OF MEMORY IS DIFFERENT THAN THE SIZE JUMPERS?<CRLF>
 5268  032236  020120  043117  046440
 5269  032244  046505  051117  020131
 5270  032252  051511  042040  043111
 5271  032260  042506  042522  052116
 5272  032266  052040  040510  020116
 5273  032274  044124  020105  044523
 5274  032302  042532  045040  046525
 5275  032310  042520  051522     200
 5276  032315     124  051505  020124          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
 5277  032322  047503  042504  041040
 5278  032330  044505  043516  051040
 5279  032336  047125  047440  042526
 5280  032344  020122  047125  041111
 5281  032352  051525     000
 5282  032355     120  051101  052111  EM51:   .ASCII  ?PARITY REPORTING THRU THE MAP IS NOT CORRECT?<CRLF>
 5283  032362  020131  042522  047520
 5284  032370  052122  047111  020107
 5285  032376  044124  052522  052040
 5286  032404  042510  046440  050101
 5287  032412  044440  020123  047516
 5288  032420  020124  047503  051122
 5289  032426  041505  100124
 5290  032432  042524  052123  041440          .ASCIZ  ?TEST CODE BEING RUN OVER UNIBUS?
 5291  032440  042117  020105  042502
 5292  032446  047111  020107  052522
 5293  032454  020116  053117  051105
 5294  032462  052440  044516  052502
 5295  032470  000123
 5296  032472  052523  046515  051101  EM52:   .ASCIZ  ?SUMMARY OF DUAL MAPPING ERRORS?
 5297  032500  020131  043117  042040
 5298  032506  040525  020114  040515
 5299  032514  050120  047111  020107
 5300  032522  051105  047522  051522
 5301  032530     000
 5302  032531     102  050131  041040  EM53:   .ASCIZ  /BYP BIT IN UBMR COULD NOT BE CLEARED/
 5303  032536  052111  044440  020116
 5304  032544  041125  051115  041440
 5305  032552  052517  042114  047040
 5306  032560  052117  041040  020105
 5307  032566  046103  040505  042522
 5308  032574  000104
 5309  032576  054502  020120  044502  EM54:   .ASCIZ  /BYP BIT IN UBMR COULD NOT BE SET/
 5310  032604  020124  047111  052440
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 5311  032612  046502  020122  047503
 5312  032620  046125  020104  047516
 5313  032626  020124  042502  051440
 5314  032634  052105     000
 5315  032637     124  040522  020120  EM55:   .ASCIZ  ?TRAP ON MK11 CSR ACCESS CAUSED UNIBUS ERROR?
 5316  032644  047117  046440  030513
 5317  032652  020061  051503  020122
 5318  032660  041501  042503  051523
 5319  032666  041440  052501  042523
 5320  032674  020104  047125  041111
 5321  032702  051525  042440  051122
 5322  032710  051117     000
 5323  032713     124  051505  020124  EM56:   .ASCIZ  ?TEST DATA REFERENCE NOT A HIT?
 5324  032720  040504  040524  051040
 5325  032726  043105  051105  047105
 5326  032734  042503  047040  052117
 5327  032742  040440  044040  052111
 5328  032750     000
 5329  032751     124  051505  020124  EM57:   .ASCII  ?TEST DATA REFERENCE NOT A MISS?<15><12>
 5330  032756  040504  040524  051040
 5331  032764  043105  051105  047105
 5332  032772  042503  047040  052117
 5333  033000  040440  046440  051511
 5334  033006  006523     012
 5335  033011     103  041501  042510          .ASCIZ  ?CACHE BYPASS ON UNIBUS MAP PAGE DID NOT INVALIDATE CACHED DATA?
 5336  033016  041040  050131  051501
 5337  033024  020123  047117  052440
 5338  033032  044516  052502  020123
 5339  033040  040515  020120  040520
 5340  033046  042507  042040  042111
 5341  033054  047040  052117  044440
 5342  033062  053116  046101  042111
 5343  033070  052101  020105  040503
 5344  033076  044103  042105  042040
 5345  033104  052101  000101
 5346  033110  044124  020105  047506  EM201:  .ASCIZ  ?THE FOLLOWING REGISTERS TIMED OUT WHEN READ?
 5347  033116  046114  053517  047111
 5348  033124  020107  042522  044507
 5349  033132  052123  051105  020123
 5350  033140  044524  042515  020104
 5351  033146  052517  020124  044127
 5352  033154  047105  051040  040505
 5353  033162  000104
 5354  033164  044124  020105  047506  EM202:  .ASCIZ  ?THE FOLLOWING MAP REGISTERS WILL NOT CLEAR?
 5355  033172  046114  053517  047111
 5356  033200  020107  040515  020120
 5357  033206  042522  044507  052123
 5358  033214  051105  020123  044527
 5359  033222  046114  047040  052117
 5360  033230  041440  042514  051101
 5361  033236     000
 5362  033237     124  042510  043040  EM203:  .ASCIZ  ?THE FOLLOWING ARE DUAL ADDRESSING ERRORS IN THE UNIBUS MAP?
 5363  033244  046117  047514  044527
 5364  033252  043516  040440  042522
 5365  033260  042040  040525  020114
 5366  033266  042101  051104  051505
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 5367  033274  044523  043516  042440
 5368  033302  051122  051117  020123
 5369  033310  047111  052040  042510
 5370  033316  052440  044516  052502
 5371  033324  020123  040515  000120
 5372  033332  044124  020105  047503  EM204:  .ASCIZ  ?THE COUNT PATTERN THRU THE MAP REGISTERS FAILED?
 5373  033340  047125  020124  040520
 5374  033346  052124  051105  020116
 5375  033354  044124  052522  052040
 5376  033362  042510  046440  050101
 5377  033370  051040  043505  051511
 5378  033376  042524  051522  043040
 5379  033404  044501  042514  000104
 5380  033412  047125  041111  051525  EM205:  .ASCIZ  ?UNIBUS DATA PATH COUNT PATTERN FAILURE?
 5381  033420  042040  052101  020101
 5382  033426  040520  044124  041440
 5383  033434  052517  052116  050040
 5384  033442  052101  042524  047122
 5385  033450  043040  044501  052514
 5386  033456  042522     000
 5387  033461     125  044516  052502  EM206:  .ASCIZ  ?UNIBUS ADDRESSING ERRORS, MAP RELOCATION DISABLED?
 5388  033466  020123  042101  051104
 5389  033474  051505  044523  043516
 5390  033502  042440  051122  051117
 5391  033510  026123  046440  050101
 5392  033516  051040  046105  041517
 5393  033524  052101  047511  020116
 5394  033532  044504  040523  046102
 5395  033540  042105     000
 5396  033543     103  052517  052116  EM207:  .ASCIZ  ?COUNT PATTERN FAILURES IN CACHE REGISTERS?
 5397  033550  050040  052101  042524
 5398  033556  047122  043040  044501
 5399  033564  052514  042522  020123
 5400  033572  047111  041440  041501
 5401  033600  042510  051040  043505
 5402  033606  051511  042524  051522
 5403  033614     000
 5404
 5405  033615     122  041505  044505  DH1:    .ASCIZ  ?RECEIVD EXPECTD TESTNO  PC AT ABORT?
 5406  033622  042126  042440  050130
 5407  033630  041505  042124  052040
 5408  033636  051505  047124  020117
 5409  033644  050040  020103  052101
 5410  033652  040440  047502  052122
 5411  033660     000
 5412  033661     122  041505  044505  DH2:    .ASCIZ  ?RECEIVD TESTNO  PC AT ABORT?
 5413  033666  042126  052040  051505
 5414  033674  047124  020117  050040
 5415  033702  020103  052101  040440
 5416  033710  047502  052122     000
 5417  033715     103  047117  044504  DH3:    .ASCII  ?CONDITN ADDRESS   MAINTEN CONTROL?<CRLF>
 5418  033722  047124  040440  042104
 5419  033730  042522  051523  020040
 5420  033736  046440  044501  052116
 5421  033744  047105  041440  047117
 5422  033752  051124  046117     200
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5423  033757     122  041505  044505  DH5:    .ASCIZ  ?RECEIVD REFERENCD REGISTR REGISTR TESTNO  PC AT ABORT?
5424  033764  042126  051040  043105
5425  033772  051105  047105  042103
5426  034000  051040  043505  051511
5427  034006  051124  051040  043505
5428  034014  051511  051124  052040
5429  034022  051505  047124  020117
5430  034030  050040  020103  052101
5431  034036  040440  047502  052122
5432  034044     000
5433  034045     123  040524  052524  DH5:    .ASCII  ?STATUS  AUTOI/D VIRTUAL?<CRLF>
5434  034052  020123  040440  052125
5435  034060  044517  042057  053040
5436  034066  051111  052524  046101
5437  034074     200
5438  034075     122  043505  051511          .ASCIZ  ?REGISTR REGISTR ADDRESS TESTNO  PC AT ABORT?
5439  034102  051124  051040  043505
5440  034110  051511  051124  040440
5441  034116  042104  042522  051523
5442  034124  052040  051505  047124
5443  034132  020117  050040  020103
5444  034140  052101  040440  047502
5445  034146  052122     000
5446  034151     122  043505  042101  DH6:    .ASCII  ?REGADRS REGADRS?<CRLF>
5447  034156  051522  051040  043505
5448  034164  042101  051522     200
5449  034171     040  047442  021122          .ASCIZ  ? ''OR''   ''AND''  #ERRORS TESTNO  ERRORPC?
5450  034176  020040  020040  040442
5451  034204  042116  020042  021440
5452  034212  051105  047522  051522
5453  034220  052040  051505  047124
5454  034226  020117  042440  051122
5455  034234  051117  041520     000
5456  034241     122  043505  042101  DH10:   .ASCII  ?REGADRS REGADRS RECEIVD RECEIVD?<CRLF>
5457  034246  051522  051040  043505
5458  034254  042101  051522  051040
5459  034262  041505  044505  042126
5460  034270  051040  041505  044505
5461  034276  042126     200
5462  034301     040  047442  021122          .ASCIZ  ? ''OR''   ''AND''  ''OR''   ''AND''  #ERRORS TESTNO  ERRORPC?
5463  034306  020040  020040  040442
5464  034314  042116  020042  020040
5465  034322  047442  021122  020040
5466  034330  020040  040442  042116
5467  034336  020042  021440  051105
5468  034344  047522  051522  052040
5469  034352  051505  047124  020117
5470  034360  042440  051122  051117
5471  034366  041520     000
5472  034371     103  052517  052116  DH12:   .ASCII  ?COUNT   COUNT?<CRLF>
5473  034376  020040  041440  052517
5474  034404  052116     200
5475  034407     105  050130  041505          .ASCIZ  ?EXPECTD RECEIVD TESTNO  ERRORPC?
5476  034414  042124  051040  041505
5477  034422  044505  042126  052040
5478  034430  051505  047124  020117
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 5479  034436  042440  051122  051117
 5480  034444  041520     000
 5481  034447     122  043505  047514  DH14:   .ASCII  ?REGLOAD REGLOAD REGDUAL REGDUAL?<CRLF>
 5482  034454  042101  051040  043505
 5483  034462  047514  042101  051040
 5484  034470  043505  052504  046101
 5485  034476  051040  043505  052504
 5486  034504  046101     200
 5487  034507     040  047442  021122          .ASCIZ  ? 'DR''   ''AND''  'DR''   ''AND''  #ERRORS TESTNO?
 5488  034514  020040  020040  040442
 5489  034522  042116  020042  020040
 5490  034530  047442  021122  020040
 5491  034536  020040  040442  042116
 5492  034544  020042  021440  051105
 5493  034552  047522  051522  052040
 5494  034560  051505  047124  000117
 5495  034566  040515  051120  043505  DH15:   .ASCII  ?MAPREG  MAPREG  EXPECTD EXPECTD RECEIVD RECEIVD?<CRLF>
 5496  034574  020040  040515  051120
 5497  034602  043505  020040  054105
 5498  034610  042520  052103  020104
 5499  034616  054105  042520  052103
 5500  034624  020104  042522  042503
 5501  034632  053111  020104  042522
 5502  034640  042503  053111  100104
 5503  034646  021040  051117  020042          .ASCIZ  ? 'DR''   ''AND''  'DR''   ''AND''  'DR''   ''AND''  #ERRORS TESTNO?
 5504  034654  020040  021040  047101
 5505  034662  021104  020040  021040
 5506  034670  051117  020042  020040
 5507  034676  021040  047101  021104
 5508  034704  020040  021040  051117
 5509  034712  020042  020040  021040
 5510  034720  047101  021104  020040
 5511  034726  042443  051122  051117
 5512  034734  020123  042524  052123
 5513  034742  047516     000
 5514  034745     122  041505  044505  DH17:   .ASCIZ  ?RECEIVD TESTNO  ERRORPC?
 5515  034752  042126  052040  051505
 5516  034760  047124  020117  042440
 5517  034766  051122  051117  041520
 5518  034774     000
 5519  034775     105  050130  041505  DH23:   .ASCII  ?EXPECTD EXPECTD RECEIVD RECEIVD?<CRLF>
 5520  035002  042124  042440  050130
 5521  035010  041505  042124  051040
 5522  035016  041505  044505  042126
 5523  035024  051040  041505  044505
 5524  035032  042126     200
 5525  035035     040  047442  021122          .ASCIZ  ? 'DR''   ''AND''  'DR''   ''AND''  #ERRORS TESTNO?
 5526  035042  020040  020040  040442
 5527  035050  042116  020042  020040
 5528  035056  047442  021122  020040
 5529  035064  020040  040442  042116
 5530  035072  020042  021440  051105
 5531  035100  047522  051522  052040
 5532  035106  051505  047124  000117
 5533  035114  042101  051104  051525  DH25:   .ASCIZ  ?ADDRUSED  BITDIFF TESTNO  ERRORPC?
 5534  035122  042105  020040  044502
```

```
5535  035130  042124  043111  020106
5536  035136  042524  052123  047516
5537  035144  020040  051105  047522
5538  035152  050122  000103
5539  035156  042101  051104  051525  DH27:   .ASCIZ  ?ADDRUSED  TESTNO  ERRORPC?
5540  035164  042105  020040  042524
5541  035172  052123  047516  020040
5542  035200  051105  047522  050122
5543  035206  000103
5544  035210  042524  052123  047516  DH30:   .ASCIZ  ?TESTNO  ERRORPC?
5545  035216  020040  051105  047522
5546  035224  050122  000103
5547  035230  042522  047515  042526  DH34:   .ASCIZ  ?REMOVED MISSING TESTNO  ERRORPC?
5548  035236  020104  044515  051523
5549  035244  047111  020107  042524
5550  035252  052123  047516  020040
5551  035260  051105  047522  050122
5552  035266  000103
5553  035270  047514  042527  052123  DH35:   .ASCIZ  ?LOWEST  HIGHEST TESTNO  ERRORPC?
5554  035276  020040  044510  044107
5555  035304  051505  020124  042524
5556  035312  052123  047516  020040
5557  035320  051105  047522  050122
5558  035326  000103
5559  035330  042524  052123  047516  DH36:   .ASCIZ  ?TESTNO  ERRORPC UNIBUS ADDRESS OF MAP REGISTER UNDER TEST?
5560  035336  020040  051105  047522
5561  035344  050122  020103  047125
5562  035352  041111  051525  040440
5563  035360  042104  042522  051523
5564  035366  047440  020106  040515
5565  035374  020120  042522  044507
5566  035402  052123  051105  052440
5567  035410  042116  051105  052040
5568  035416  051505  000124
5569  035422  047503  042116  052111  DH40:   .ASCII  ?CONDITN CONDITN?<CRLF>
5570  035430  020116  047503  042116
5571  035436  052111  100116
5572  035442  054105  042520  052103          .ASCIZ  ?EXPECTD RECEIVD TESTNO  ERRORPC?
5573  035450  020104  042522  042503
5574  035456  053111  020104  042524
5575  035464  052123  047516  020040
5576  035472  051105  047522  050122
5577  035500  000103
5578  035502  047503  051122  041505  DH41:   .ASCII  ?CORRECT ADDRESS?<CRLF>
5579  035510  020124  042101  051104
5580  035516  051505  100123
5581  035522  042101  051104  051505          .ASCIZ  ?ADDRESS FETCHED TESTNO  ERRORPC?
5582  035530  020123  042506  041524
5583  035536  042510  020104  042524
5584  035544  052123  047516  020040
5585  035552  051105  047522  050122
5586  035560  000103
5587  035562  047503  051122  041505  DH42:   .ASCII  ?CORRECT EXPECTD RECEIVD?<CRLF>
5588  035570  020124  054105  042520
5589  035576  052103  020104  042522
5590  035604  042503  053111  100104
```

```
5591  035612  042101  051104  051505          .ASCIZ  ?ADDRESS DATA    FROM UB TESTNO  ERRORPC?
5592  035620  020123  040504  040524
5593  035626  020040  020040  051106
5594  035634  046517  052440  020102
5595  035642  042524  052123  047516
5596  035650  020040  051105  047522
5597  035656  050122  000103
5598  035662  044523  045132  046525  DH43:   .ASCIZ  ?SIZJUMP TOPFOUND TESTNO ERRORPC?
5599  035670  020120  047524  043120
5600  035676  052517  042116  052040
5601  035704  051505  047124  020117
5602  035712  051105  047522  050122
5603  035720  000103
5604  035722  047503  042116  052111  DH44:   .ASCII  ?CONDITN CONDITN ADDRESS   MAINTEN CONTROL?<CRLF>
5605  035730  020116  047503  042116
5606  035736  052111  020116  042101
5607  035744  051104  051505  020123
5608  035752  020040  040515  047111
5609  035760  042524  020116  047503
5610  035766  052116  047522  100114
5611  035774  054105  042520  052103          .ASCIZ  ?EXPECTD RECEIVD REFERENCD REGISTR REGISTR TESTNO  ERRORPC?
5612  036002  020104  042522  042503
5613  036010  053111  020104  042522
5614  036016  042506  042522  041516
5615  036024  020104  042522  044507
5616  036032  052123  020122  042522
5617  036040  044507  052123  020122
5618  036046  042524  052123  047516
5619  036054  020040  051105  047522
5620  036062  050122  000103
5621  036066  020040  020040  041520  DH53:   .ASCIZ  /    PC    UBMR  (UBMR)/
5622  036074  020040  020040  041125
5623  036102  051115  020040  052450
5624  036110  046502  024522     000
5625  036115     105  051122  051117  DH55:   .ASCIZ  /ERRORPC  MKCSR     MSER     CPUERR/
5626  036122  041520  020040  045515
5627  036130  051503  020122  020040
5628  036136  020040  051515  051105
5629  036144  020040  020040  041440
5630  036152  052520  051105  000122
5631  036160  020040  041520  020040  DH56:   .ASCIZ  /  PC     CCR   GROUP   TST-DATA-ADRS/
5632  036166  020040  041440  051103
5633  036174  020040  043440  047522
5634  036202  050125  020040  052040
5635  036210  052123  042055  052101
5636  036216  026501  042101  051522
5637  036224     000
5638  036225     040  050040  020103  DH57:   .ASCIZ  /  PC    CCR    UBMR   TST-DATA-ADRS/
5639  036232  020040  041440  051103
5640  036240  020040  020040  041125
5641  036246  051115  020040  052040
5642  036254  052123  042055  052101
5643  036262  026501  042101  051522
5644  036270     000
5645  036271     122  043505  042101  DH201:  .ASCIZ  ?REGADRS TESTNO  ERRORPC?
5646  036276  051522  052040  051505
```

```
5647  036304  047124  020117  042440
5648  036312  051122  051117  041520
5649  036320    000
5650  036321    122  043505  042101  DH202:  .ASCIZ  ?REGADRS DATAREC TESTNO  ERRORPC?
5651  036326  051522  042040  052101
5652  036334  051101  041505  052040
5653  036342  051505  047124  020117
5654  036350  042440  051122  051117
5655  036356  041520    000
5656  036361    115  050101  042522  DH203:  .ASCII  ?MAPREG  MAPREG?<CRLF>
5657  036366  020107  046440  050101
5658  036374  042522  100107
5659  036400  042524  052123  047111          .ASCIZ  ?TESTING DUALED  TESTNO  ERRORPC?
5660  036406  020107  052504  046101
5661  036414  042105  020040  042524
5662  036422  052123  047516  020040
5663  036430  051105  047522  050122
5664  036436  000103
5665  036440  042522  040507  051104  DH204:  .ASCIZ  ?REGADRS PATTERN EXPECTD RECEIVD TESTNO  ERRORPC?
5666  036446  020123  040520  052124
5667  036454  051105  020116  054105
5668  036462  042520  052103  020104
5669  036470  042522  042503  053111
5670  036476  020104  042524  052123
5671  036504  047516  020040  051105
5672  036512  047522  050122  000103
5673  036520  054105  042520  052103  DH205:  .ASCIZ  ?EXPECTD RECEIVD ADDRSLOAD TESTNO  ERRORPC?
5674  036526  020104  042522  042503
5675  036534  053111  020104  042101
5676  036542  051104  046123  040517
5677  036550  020104  042524  052123
5678  036556  047516  020040  051105
5679  036564  047522  050122  000103
5680  036572  042101  051104  051505  DH206:  .ASCII  ?ADDRESS ADDRESS?<CRLF>
5681  036600  020123  042101  051104
5682  036606  051505  100123
5683  036612  054105  042520  052103          .ASCIZ  ?EXPECTD RECEIVD TESTNO  ERRORPC?
5684  036620  020104  042522  042503
5685  036626  053111  020104  042524
5686  036634  052123  047516  020040
5687  036642  051105  047522  050122
5688  036650  000103
5689  036652  042522  044507  052123  DH207:  .ASCII  ?REGISTR EXPECTD RECEIVD?<CRLF>
5690  036660  020122  054105  042520
5691  036666  052103  020104  042522
5692  036674  042503  053111  100104
5693  036702  042101  051104  051505          .ASCIZ  ?ADDRESS  DATA    DATA   TESTNO  ERRORPC?
5694  036710  020123  042040  052101
5695  036716  020101  020040  042040
5696  036724  052101  020101  020040
5697  036732  042524  052123  047516
5698  036740  020040  051105  047522
5699  036746  050122  000103
5700
5701
5702                                          .EVEN
```

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5703  036752  001266  001264  001262  DT1:    .WORD   PCPUER,CPUEXP,TESTNO,BADPC,0
5704  036760  001302  000000
5705  036764  001266  001262  001302  DT2:    .WORD   PCPUER,TESTNO,BADPC,0
5706  036772  000000
5707  036774  001274  001270  001300  DT3:    .WORD   PPARER,PLOADR,PMAINT,PCONTR,TESTNO,BADPC,0
5708  037002  001276  001262  001302
5709  037010  000000
5710  037012  001154  001170  001262  DT4:    .WORD   $REG0,$TMP0,TESTNO,$ERRPC,0
5711  037020  001116  000000
5712  037024  001312  001314  001316  DT5:    .WORD   PMMR0,PMMR1,PMMR2,TESTNO,BADPC,0
5713  037032  001262  001302  000000
5714  037040  001226  001224  001254  DT6:    .WORD   ADDROR,ADRAND,ERRCNT,TESTNO,$ERRPC,0
5715  037046  001262  001116  000000
5716  037054  001226  001224  001232  DT10:   .WORD   ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO,$ERRPC,0
5717  037062  001230  001254  001262
5718  037070  001116  000000
5719  037074  001160  001154  001262  DT12:   .WORD   $REG2,$REG0,TESTNO,$ERRPC,0
5720  037102  001116  000000
5721  037106  001162  001156  001262  DT13:   .WORD   $REG3,$REG1,TESTNO,$ERRPC,0
5722  037114  001116  000000
5723  037120  001226  001224  001232  DT14:   .WORD   ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO,0
5724  037126  001230  001254  001262
5725  037134  000000
5726  037136  001226  001224  001236  DT15:   .WORD   ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,ERRCNT,TESTNO,0
5727  037144  001234  001232  001230
5728  037152  001254  001262  000000
5729  037160  001154  001262  001116  DT17:   .WORD   $REG0,TESTNO,$ERRPC,0
5730  037166  000000
5731  037170  001156  001262  001116  DT20:   .WORD   $REG1,TESTNO,$ERRPC,0
5732  037176  000000
5733  037200  001236  001234  001232  DT23:   .WORD   PATTOR,PATAND,DATAOR,DATAND,ERRCNT,TESTNO,0
5734  037206  001230  001254  001262
5735  037214  000000
5736  037216  001164  001154  001262  DT25:   .WORD   $REG4,$REG0,TESTNO,$ERRPC,0
5737  037224  001116  000000
5738  037230  001156  001262  001116  DT27:   .WORD   $REG1,TESTNO,$ERRPC,0
5739  037236  000000
5740  037240  001262  001116  000000  DT30:   .WORD   TESTNO,$ERRPC,0
5741  037246  001254  001256  001262  DT34:   .WORD   ERRCNT,CNTR,TESTNO,$ERRPC,0
5742  037254  001116  000000
5743  037260  001240  001242  001262  DT35:   .WORD   LOWEST,HIGEST,TESTNO,$ERRPC,0
5744  037266  001116  000000
5745  037272  001262  001116  001154  DT36:   .WORD   TESTNO,$ERRPC,$REG0,0
5746  037300  000000
5747  037302  001226  001224  001232  DT37:   .WORD   ADDROR,ADRAND,DATAOR,DATAND,ERRCNT,TESTNO,0
5748  037310  001230  001254  001262
5749  037316  000000
5750  037320  001264  001266  001262  DT40:   .WORD   CPUEXP,PCPUER,TESTNO,$ERRPC,0
5751  037326  001116  000000
5752  037332  001160  001156  001262  DT41:   .WORD   $REG2,$REG1,TESTNO,$ERRPC,0
5753  037340  001116  000000
5754  037344  001156  001162  001160  DT42:   .WORD   $REG1,$REG3,$REG2,TESTNO,$ERRPC,0
5755  037352  001262  001116  000000
5756  037360  177760  001320  001262  DT43:   .WORD   SIZELO,RSIZE,TESTNO,$ERRPC,0
5757  037366  001116  000000
5758  037372  001200  001274  001270  DT44:   .WORD   $TMP4,PPARER,PLOADR,PMAINT,PCONTR,TESTNO,$ERRPC,0
```

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 5759  037400  001300  001276  001262
 5760  037406  001116  000000
 5761  037412  001116  001154  001156  DT53:   .WORD   $ERRPC,$REG0,$REG1,0
 5762  037420  000000
 5763  037422  001262  001160  001172  DT55:   .WORD   TESTNO,$REG2,$TMP1,$TMP2,0
 5764  037430  001174  000000
 5765  037434  001116  001154  001156  DT56:   .WORD   $ERRPC,$REG0,$REG1,$REG2,0
 5766  037442  001160  000000
 5767  037446  001116  001154  001156  DT57:   .WORD   $ERRPC,$REG0,$REG1,$REG2,0
 5768  037454  001160  000000
 5769  037460  001154  001262  001116  DT201:  .WORD   $REG0,TESTNO,$ERRPC,0
 5770  037466  000000
 5771  037470  001154  001170  001262  DT202:  .WORD   $REG0,$TMP0,TESTNO,$ERRPC,0
 5772  037476  001116  000000
 5773  037502  001154  001156  001262  DT203:  .WORD   $REG0,$REG1,TESTNO,$ERRPC,0
 5774  037510  001116  000000
 5775  037514  001154  001160  001164  DT204:  .WORD   $REG0,$REG2,$REG4,$REG3,TESTNO,$ERRPC,0
 5776  037522  001162  001262  001116
 5777  037530  000000
 5778  037532  001156  001154  001160  DT205:  .WORD   $REG1,$REG0,$REG2,TESTNO,$ERRPC,0
 5779  037540  001262  001116  000000
 5780  037546  001154  001162  001262  DT206:  .WORD   $REG0,$REG3,TESTNO,$ERRPC,0
 5781  037554  001116  000000
 5782  037560  001154  001160  001162  DT207:  .WORD   $REG0,$REG2,$REG3,TESTNO,$ERRPC,0
 5783  037566  001262  001116  000000
 5784
 5785
 5786  037574       000       000       000  DF1:    .BYTE   0,0,0,0
 5787  037577       000
 5788  037600       000       000       000  DF2:    .BYTE   0,0,0
 5789  037603       000       002       000  DF3:    .BYTE   0,2,0,0,0,0
 5790  037606       000       000       000
 5791  037611       000       000       000  DF5:    .BYTE   0,0,0,0,0
 5792  037614       000       000
 5793  037616       000       000       001  DF6:    .BYTE   0,0,1,0,0
 5794  037621       000       000
 5795  037623       000       000       000  DF10:   .BYTE   0,0,0,0,1,0,0
 5796  037626       000       001       000
 5797  037631       000
 5798  037632       000       000       000  DF12:   .BYTE   0,0,0,0
 5799  037635       000
 5800  037636       000       000       000  DF14:   .BYTE   0,0,0,0,1,0
 5801  037641       000       001       000
 5802  037644       000       000       000  DF15:   .BYTE   0,0,0,0,0,0,1,0
 5803  037647       000       000       000
 5804  037652       001       000
 5805  037654       000       000       000  DF17:   .BYTE   0,0,0
 5806  037657       000       000       000  DF23:   .BYTE   0,0,0,0,1,0
 5807  037662       000       001       000
 5808  037665       003       004       000  DF25:   .BYTE   3,4,0,0
 5809  037670       000
 5810  037671       003       000       000  DF27:   .BYTE   3,0,0
 5811  037674       000       000            DF30:   .BYTE   0,0
 5812  037676       000       000       000  DF34:   .BYTE   0,0,0,0
 5813  037701       000
 5814  037702       004       004       000  DF35:   .BYTE   4,4,0,0
```

```
5815  037705  000
5816  037706  000  000  003  DF36:  .BYTE  0,0,3
5817  037711  000  000  000  DF37:  .BYTE  0,0,0,0,1,0
5818  037714  000  001  000
5819  037717  000  000  000  DF40:  .BYTE  0,0,0,0
5820  037722  000
5821  037723  000  000  000  DF41:  .BYTE  0,0,0,0
5822  037726  000
5823  037727  003  000  000  DF42:  .BYTE  3,0,0,0,0
5824  037732  000  000
5825  037734  000  000  000  DF43:  .BYTE  0,0,0,0
5826  037737  000
5827  037740  000  000  002  DF44:  .BYTE  0,0,2,0,0,0,0
5828  037743  000  000  000
5829  037746  000
5830  037747  000  000  000  DF201:  .BYTE  0,0,0
5831  037752  000  000  000  DF202:  .BYTE  0,0,0,0
5832  037755  000
5833  037756  000  000  000  DF203:  .BYTE  0,0,0,0
5834  037761  000
5835  037762  000  000  000  DF204:  .BYTE  0,0,0,0,0,0
5836  037765  000  000  000
5837  037770  000  000  003  DF205:  .BYTE  0,0,3,0,0
5838  037773  000  000
5839  037775  000  000  000  DF206:  .BYTE  0,0,0,0
5840  040000  000
5841  040001  000  000  000  DF207:  .BYTE  0,0,0,0,0
5842  040004  000  000
5843
5844                                .EVEN
5845  040006  000017               SAVEA:  .BLKW  17
5846
5847          040044               TSLOC=.                    ;GET PC TO AN EVEN WORD BOUNDARY
5848          040044               TSLOC=-4&TSLOC
5849          040050               TSLOC=TSLOC+4
5850          040050               .=TSLOC
5851
5852  040050  001000               TSTDAT:  .BLKW  512.
5853          000001                        .END
```

```
ADDROR  001226          519#    987*   1755*  1781*  1808*  1834*  2855*  3324*  5714  5716  5723  5726  5747
ADRAND  001224          518#    991*   1757*  1783*  1810*  1836*  2859*  3319*  5714  5716  5723  5726  5747
BADPC   001302          547#   1939*   1985*  2031*  5703   5705   5707   5712
BIT0  = 000001          133#   2121    2122   2129   2909
BIT00 = 000001          123#    133
BIT01 = 000002          122#    132
BIT02 = 000004          121#    131
BIT03 = 000010          120#    130
BIT04 = 000020          119#    129
BIT05 = 000040          118#    128
BIT06 = 000100          117#    127
BIT07 = 000200          116#    126
BIT08 = 000400          115#    125    1007
BIT09 = 001000          114#    124    1017   1090
BIT1  = 000002          132#   1994*
BIT10 = 002000          113#   1073
BIT11 = 004000          112#   1024    2124   2125   2127   2935
BIT12 = 010000          111#    417    4750
BIT13 = 020000          110#   1080
BIT14 = 040000          109#   2116    2117   2119
BIT15 = 100000          108#    416    2130   2131   2133   2135   2136   2138   3774  3845  4369  4442
BIT2  = 000004          131#    420     421   3763   4358
BIT3  = 000010          130#    420     421   3834   4431
BIT4  = 000020          129#    419     421   1686   2910   2929   4549
BIT5  = 000040          128#    418     420   2974   3144   3281   3351   3571
BIT6  = 000100          127#
BIT7  = 000200          126#
BIT8  = 000400          125#   2151
BIT9  = 001000          124#   1143
BPTVEC= 000014          140#
BYP   = 100000          416#   4495    4501   4502   4508   4509   4645   4659
CACHVE= 000114          147#   1976*   1988*  1997*  2177*  2179*  3661*  3672*  3718* 3729* 3781* 3800* 3852*
                       3871*   4250*   4261*  4310*  4321*  4376*  4395*  4449*  4468*
CACOUN  005576         1892#   2844    2874
CBMP    023702         4579    4581    4583#  4592
CBMPA   023722         4588#   4687
CISP    001333          562#
CLRMAP  005134         1723#   2547    3033   3230
CNTR    001256          537#   3172*   3176   3180*  5741
CONTRL= 177746          157#   1983    2113   2143*  2144   2774   2778*  2779  2833  2834  2836  2861* 2881*
                       3652    3653*   3673*  3681   3707   3708*  3730*  3738  3763  3765  3778* 3801* 3809
                       3834    3836    3849*  3872*  3880   4241   4242*  4262* 4270  4299  4300* 4322* 4330
                       4358    4360    4373*  4396*  4404   4431   4433   4446* 4469* 4477  4588* 4589  4594*
                       4596*   4602*   4632   4667
COUNT   005432         1833#   2600    2644   2689   2733
CPFLAG  005654         1103*   1927#   1948*  2193*
CPUER   005652         1926#   2183    2291
CPUERR= 177766          170#   1099*   1749   1750*  1938   1947*  2198*  4549  4553  4555*
CPUEXP  001264          540#   1751    1940   1942   2189*  2930*  2953*  2970* 3008* 3034* 3072* 3093* 3111*
                       3138*   3181*   3352*  3370*  3581*  3592*  3626*  3936* 3954* 4170* 4181* 4215* 5703
                       5750
CR    = 000015           45#   1393    1403
CRLF  = 000200           46#   1366    1403   2091   4766   4772   4774   4776  4781  4928  4943  4959  4977
                       5029    5043    5081   5100   5118   5127   5137   5220  5236  5251  5267  5282  5417
                       5433    5446    5456   5472   5481   5495   5519   5569  5578  5587  5604  5656  5680
                       5689
```

```
DATA    001326   558#  3583  3607*  3614*  3615*  3616*  4172  4196*  4203*  4204*  4205*
DATAND  001230   520#  990*  1787*  1814*  1840*  1871*  1900*  2858*  3322*  5716  5723  5726  5733
                 5747
DATAOR  001232   521#  986*  1785*  1812*  1838*  1869*  1898*  2854*  3325*  5716  5723  5726  5733
                 5747
DF1     037574   587   900   914   5786#
DF10    037623   637   644   5795#
DF12    037632   651   658   907   5798#
DF14    037636   665   5800#
DF15    037644   672   679   5802#
DF17    037654   686   693   700   707   5805#
DF2     037600   593   5788#
DF201   037747   924   5830#
DF202   037752   930   5831#
DF203   037756   937   5833#
DF204   037762   943   5835#
DF205   037770   949   5837#
DF206   037775   956   5839#
DF207   040001   963   5841#
DF23    037657   714   721   756   5806#
DF25    037665   728   735   5808#
DF27    037671   742   5810#
DF3     037603   601   609   5789#
DF30    037674   749   762   770   887   894   5811#
DF34    037676   777   5812#
DF35    037702   786   5814#
DF36    037706   792   5816#
DF37    037711   799   880   5817#
DF40    037717   806   841   5819#
DF41    037723   813   849   5821#
DF42    037727   820   857   5823#
DF43    037734   826   864   5825#
DF44    037740   833   873   5827#
DF5     037611   616   5791#
DF6     037616   623   630   5793#
DH1     033615   585   5405#
DH10    034241   634   641   5456#
DH12    034371   648   655   5472#
DH14    034447   662   5481#
DH15    034566   669   676   5495#
DH17    034745   684   691   698   705   5514#
DH2     033661   591   5412#
DH201   036271   922   5645#
DH202   036321   928   5650#
DH203   036361   934   5656#
DH204   036440   941   5665#
DH205   036520   947   5673#
DH206   036572   953   5680#
DH207   036652   960   5689#
DH23    034775   711   718   753   796   877   5519#
DH25    035114   726   733   5533#
DH27    035156   740   5539#
DH3     033715   598   606   5417#
DH30    035210   747   760   768   5544#
DH34    035230   775   5547#
DH35    035270   784   5553#
```

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DH36    035330              790    5559#
DH40    035422              803     838    5569#
DH41    035502              810     846    5578#
DH42    035562              817     854    5587#
DH43    035662              824     862    5598#
DH44    035722              830     870    5604#
DH5     034045              613    5433#
DH53    036066              885     892    5621#
DH55    036115              898    5625#
DH56    036160              905    5631#
DH57    036225              912    5638#
DH6     034151              620     627    5446#
DISPLA= 177570               40#   1038*   1069*   2928*   3137*   3934*
DT1     036752              586    5703#
DT10    037054              636     643    5716#
DT12    037074              650    5719#
DT13    037106              657    5721#
DT14    037120              664    5723#
DT15    037136              671     678    5726#
DT17    037160              685     699     706    5729#
DT2     036764              592    5705#
DT20    037170              692    5731#
DT201   037460              923    5769#
DT202   037470              929    5771#
DT203   037502              936    5773#
DT204   037514              942    5775#
DT205   037532              948    5778#
DT206   037546              955    5780#
DT207   037560              962    5782#
DT23    037200              713     720     755    5733#
DT25    037216              727     734    5736#
DT27    037230              741    5738#
DT3     036774              600     608    5707#
DT30    037240              748     761     769    5740#
DT34    037246              776    5741#
DT35    037260              785    5743#
DT36    037272              791    5745#
DT37    037302              798     879    5747#
DT4     037012             5710#
DT40    037320              805     840    5750#
DT41    037332              812     848    5752#
DT42    037344              819     856    5754#
DT43    037360              825     863    5756#
DT44    037372              832     872    5758#
DT5     037024              615    5712#
DT53    037412              886     893    5761#
DT55    037422              899    5763#
DT56    037434              906    5765#
DT57    037446              913    5767#
DT6     037040              622     629    5714#
DUALAD  005356             1806#   2555    3246
EMTVEC= 000030              143#   2060*   2061*
EM1     024773              584    4786#
EM10    025604              633    4854#
EM11    025675              640    4864#
EM12    025767              647    4874#
```

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EM13    026055              654    4884#
EM14    026147              661    4894#
EM15    026242              668    4904#
EM16    026346              675    4916#
EM17    026451              682    4928#
EM2     025055              590    4795#
EM20    026573              689    4943#
EM201   033110              921    5346#
EM202   033164              927    5354#
EM203   033237              933    5362#
EM204   033332              940    5372#
EM205   033412              946    5380#
EM206   033461              952    5387#
EM207   033543              959    5396#
EM21    026721              696    4959#
EM22    027065              703    4977#
EM23    027231              710    4995#
EM24    027325              717    5006#
EM25    027425              724    5017#
EM26    027532              731     738    5029#
EM3     025124              596    4802#
EM30    027653              745    5043#
EM31    030027              752    5063#
EM32    030121              759    5073#
EM33    030173              765    5081#
EM34    030350              773    5100#
EM35    030521              780    5118#
EM36    031006              789    5151#
EM37    031103              795    5162#
EM4     025225              604    4813#
EM40    031206              802    5174#
EM41    031301              809    5184#
EM42    031363              816    5193#
EM43    031456              823    5203#
EM44    031543              829    5212#
EM45    031620              836    5220#
EM46    031753              844    5236#
EM47    032075              852    5251#
EM5     025334              612    4825#
EM50    032230              860    5267#
EM51    032355              868    5282#
EM52    032472              876    5296#
EM53    032531              884    5302#
EM54    032576              891    5309#
EM55    032637              897    5315#
EM56    032713              904    5323#
EM57    032751              911    5329#
EM6     025442              619    4837#
EM7     025522              626    4845#
ENDKB   010614             2154    2159#
EREXIT  003034             1098    1106#
ERRCNT  001254              536#    985*  1060*  1759  1789  1816  1846  1873  2231  2262  2304  2338  2372
                           2406    2564  2611   2655  2700  2744  2848  2853* 2877  3067  3168* 3176  3179*
                           3261    3326  3332   5714  5716  5723  5726  5733  5741  5747
ERRVEC= 000004              136#    998   999*  1001* 1004* 2183* 2184* 2221* 2291*
ERTYPE  003036             1082    1133#
```

```
ER200   002124            916#  1153  1156
FLAG    001260            538#
GNS   = ****** U          430   1574  1575  1576  1577  1578  1579  1580  1581  1582  2090  4719  4726
HIADRS= 177742            155#  1981  2800  3679  3736  3807  3878  4268  4328  4402  4475
HIGEST  001242            526#  3159* 3186  3193  3250  3259  5743
HITMIS= 177752            159#  2258  4630  4665
HREGL   001250            532#  3204*
HREGU   001252            534#  3206*
HT    = 000011             43#  1364  1403
IOTVEC= 000020            141#  2058* 2059*
KBTST   010340           2105#
KB11CM  001332            561#  2105* 2153* 2165  2487  3623  4212  4491  4533  4580
KB11E   001330            559#  2106* 2110* 2149  2151* 2163  2171
KB11EM  001331            560#  2485  3621  4210  4489  4531  4578
KDPAR0= 172360            313#
KDPAR1= 172362            314#
KDPAR2= 172364            315#
KDPAR3= 172366            316#
KDPAR4= 172370            317#
KDPAR5= 172372            318#
KDPAR6= 172374            319#
KDPAR7= 172376            320#
KDPDR0= 172320            291#
KDPDR1= 172322            292#
KDPDR2= 172324            293#
KDPDR3= 172326            294#
KDPDR4= 172330            295#
KDPDR5= 172332            296#
KDPDR6= 172334            297#
KDPDR7= 172336            298#
KERSTK= 001100             30#  1936
KIPAR0= 172340            302#  1245  2901* 3914* 4608*
KIPAR1= 172342            303#  2902* 3912* 4610*
KIPAR2= 172344            304#  2903* 4612*
KIPAR3= 172346            305#  2904*
KIPAR4= 172350            306#  2905* 3146* 3153* 3154  3158  3159  3160* 3161  3173* 3174  3240* 3282*
                         3289*  3290  3353* 3578* 3606  3608* 3937* 4167* 4195  4197*
KIPAR5= 172352            307#  2906* 3047* 3048*
KIPAR6= 172354            308#  2907* 2932* 2937* 2948* 2972* 2976* 2983* 3036* 3042* 3043  3047  3095
                         3297   3300  3312* 3313  3395* 3410* 3425* 3440* 3455* 3470* 3485* 3500* 3515*
                         3530*  3545* 3579* 3654* 3709* 3769* 3840* 3984* 3999* 4014* 4029* 4044* 4059*
                         4074*  4089* 4104* 4119* 4134* 4168* 4243* 4301* 4364* 4437* 4583* 4686*
KIPAR7= 172356            309#  2908* 4606*
KIPDR0= 172300            280#  2130* 2131  2133* 2893* 4609*
KIPDR1= 172302            281#  2894* 4611*
KIPDR2= 172304            282#  2895* 4613*
KIPDR3= 172306            283#  2896*
KIPDR4= 172310            284#  2897*
KIPDR5= 172312            285#  2898*
KIPDR6= 172314            286#  2899* 4584*
KIPDR7= 172316            287#  2900* 4607*
LF    = 000012             44#  1397  1403
LOADRS= 177740            154#  1980  2253  2793  3678  3735  3806  3877  4267  4327  4401  4474
LOOP    010676           2177#  4760
LOWEST  001240            524#  3158* 3184  3194  3235  3236  3353  3395  3410  3425  3440  3455  3470
                         3485   3500  3515  3530  3545  3579  3654  3709  3769  3840  3910  3937  3984
```

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                    3999    4014    4029    4044    4059    4074    4089    4104    4119    4134    4168    4243    4301
                    4364    4437    5743
LREGL   001244       528#   3201*   3234    3355*   3394*   3409*   3424*   3439*   3454*   3469*   3484*   3499*   3514*
                    3529*   3544*   3575*   3609*   3655*   3710*   3771*   3842*   3939*   3983*   3998*   4013*   4028*
                    4043*   4058*   4073*   4088*   4103*   4118*   4133*   4164*   4198*   4244*   4302*   4366*   4439*
LREGU   001246       530#   3203*   3354*   3393*   3408*   3423*   3438*   3453*   3468*   3483*   3498*   3513*   3528*
                    3543*   3574*   3611*   3612    3656*   3711*   3770*   3841*   3904    3938*   3982*   3997*   4012*
                    4027*   4042*   4057*   4072*   4087*   4102*   4117*   4132*   4163*   4200*   4201    4245*   4303*
                    4365*   4438*
MAINT = 177750       158#   1984    2111*   2114    2786*   2787    2862    3657    3662*   3712    3719*   3772    3782*
                    3843    3853*   4246    4251*   4304    4311*   4367    4377*   4440    4450*
MAPH0 = 170202       397#   2326    2493*
MAPH00= 170202       333#    397    2115    2494    2638
MAPH01= 170206       335#    399
MAPH02= 170212       337#    401
MAPH03= 170216       339#    403
MAPH04= 170222       341#    405
MAPH05= 170226       343#    407
MAPH06= 170232       345#    409
MAPH07= 170236       347#    411
MAPH1 = 170206       399#
MAPH10= 170242       349#
MAPH11= 170246       351#
MAPH12= 170252       353#
MAPH13= 170256       355#
MAPH14= 170262       357#
MAPH15= 170266       359#
MAPH16= 170272       361#
MAPH17= 170276       363#   2334    2647
MAPH2 = 170212       401#
MAPH20= 170302       365#   2394    2507*   2508    2727
MAPH21= 170306       367#
MAPH22= 170312       369#
MAPH23= 170316       371#
MAPH24= 170320       373#
MAPH25= 170326       375#
MAPH26= 170332       377#
MAPH27= 170336       379#
MAPH3 = 170216       403#
MAPH30= 170342       381#
MAPH31= 170346       383#
MAPH32= 170352       385#
MAPH33= 170356       387#
MAPH34= 170362       389#
MAPH35= 170366       391#   4682
MAPH36= 170372       393#
MAPH37= 170376       395#   1725    2227    2402    2546    2560    2736
MAPH4 = 170222       405#
MAPH5 = 170226       407#
MAPH6 = 170232       409#
MAPH7 = 170236       411#
MAPL0 = 170200       396#   1723    2222    2292    2544    2557    2934*   2943    3139
MAPL00= 170200       332#    396    2442*   2443    2594    4586
MAPL01= 170204       334#    398
MAPL02= 170210       336#    400
MAPL03= 170214       338#    402
```

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MAPL04= 170220          340#    404
MAPL05= 170224          342#    406
MAPL06= 170230          344#    408
MAPL07= 170234          346#    410
MAPL1 = 170204          398#
MAPL10= 170240          348#
MAPL11= 170244          350#
MAPL12= 170250          352#
MAPL13= 170254          354#
MAPL14= 170260          356#
MAPL15= 170264          358#
MAPL16= 170270          360#
MAPL17= 170274          362#    2300    2603
MAPL2 = 170210          400#
MAPL20= 170300          364#    2360    2454*   2455    2683
MAPL21= 170304          366#
MAPL22= 170310          368#
MAPL23= 170314          370#
MAPL24= 170320          372#
MAPL25= 170324          374#
MAPL26= 170330          376#
MAPL27= 170334          378#
MAPL3 = 170214          402#
MAPL30= 170340          380#
MAPL31= 170344          382#
MAPL32= 170350          384#
MAPL33= 170354          386#
MAPL34= 170360          388#
MAPL35= 170364          390#
MAPL36= 170370          392#
MAPL37= 170374          394#    2368    2692    3142
MAPL4 = 170220          404#
MAPL5 = 170224          406#
MAPL6 = 170230          408#
MAPL7 = 170234          410#
MEMER   005764          1968#   1988    1997    2177    3672    3729    3800    3871    4261    4321    4395    4468
MEMERR= 177744           156#   1100*   1982    2006*   2197*   2791*   2798*   3651*   3671*   3680    3706*   3728*   3737
                        3768*   3799*   3808    3839*   3870*   3879    4240*   4260*   4269    4298*   4320*   4329    4363*
                        4394*   4403    4436*   4467*   4476
MFPT  = 000007           565#   2108
MFPTTR  010606          2107    2156#
MKCSR = 172100          4528#   4535
MMFLAG  006212          1105*   2024#   2039*   2196*
MMR0  = 177572           181#    185    1101*   2034    2038*   2190*   2909*   4627*   4657*   4704*
MMR1  = 177574           182#    186    2035
MMR2  = 177576           183#    187    2036
MMR3  = 172516           184#    188    2191*   2910*   3144*   3281*   3351*   4626*   4658*   4705*
MMTRAP  006210          2023#   2180
MMVEC = 000250           149#   2180*   2182*
MSER  = 177744           422#   4530#   4547    4552
MSG1    024650          2162    4766#
MSG2    024707          2175    4772#
MSG3    024720          2167    4774#
MSG4    024732          2169    4776#
MSG5    024763          2173    4781#
NEXMEM= 000040          3571#   3592    3594    4181    4183
```

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NXTTST  001324   556# 2004  2219* 2251* 2289* 2324* 2358* 2392* 2435* 2479* 2541* 2587* 2631*
                2676* 2720* 2770* 2829* 2968* 3030* 3091* 3129* 3227* 3279* 3349* 3386* 3568*
                3646* 3702* 3760* 3831* 3935* 3973* 4159* 4235* 4294* 4355* 4428* 4488* 4527*
                4577*
OLDPC   001304   548# 1747* 1766  1780* 1794  1807* 1821  1833* 1851  1864* 1878  1893* 1907
                1934* 1939  1950  1978* 1985  2002* 2004* 2009  2032* 2041
OLDPS   001306   549# 1748* 1765  1935* 1949  1979* 2008  2033* 2040
OLDPSW  001310   550# 1690* 1707  1708*
PADRSH  001222   516# 1251* 1273*
PADRSL  001220   514# 1252* 1253  1272* 1274
PAFLAG  005766  1104* 1969# 2007* 2195*
PATAND  001234   522#  992* 1844* 1867* 1896* 2860* 5726  5733
PATTOR  001236   523#  988* 1842* 1865* 1894* 2856* 5726  5733
PCONTR  001276   545# 1983* 3681* 3738* 3809* 3880* 4270* 4330* 4404* 4477* 5707  5758
PCPUER  001266   541# 1749* 1750  1751  1938* 1942  1947  3037* 3040  3357* 3366  3582* 3590
                3594  3941* 3950  4171* 4179  4183  5703  5705  5750
PHIADR  001272   543# 1981* 3679* 3736* 3807* 3878* 4268* 4328* 4402* 4475*
PIRQ   = 177772    38#
PIRQVE= 000240   148#
PLOADR  001270   542# 1980* 1992  3678* 3735* 3806* 3877* 4267* 4327* 4401* 4474* 5707  5758
PMAINT  001300   546# 1984* 3682* 3739* 3810* 3881* 4271* 4331* 4405* 4478* 5707  5758
PMMR0   001312   551# 2034* 5712
PMMR1   001314   552# 2035* 5712
PMMR2   001316   553# 2036* 5712
PPARER  001274   544# 1982* 1986  2006  3650* 3668  3680* 3705* 3725  3737* 3767* 3795  3808*
                3838* 3866  3879* 4239* 4257  4269* 4297* 4317  4329* 4362* 4390  4403* 4435*
                4463  4476* 5707  5758
PR0    = 000000    70#
PR1    = 000040    71#
PR2    = 000100    72#
PR3    = 000140    73#
PR4    = 000200    74#
PR5    = 000240    75#
PR6    = 000300    76#
PR7    = 000340    77#
PS     = 177776    35#   36  2052* 4571  4748
PSW    = 177776    36#
PWRMSG  004704  1616  1623#
PWRVEC= 000024   142# 1589* 1590* 1598* 1613* 1614* 2064* 2065*
RESREG= 104414  1260  1580# 1658
RESVEC= 000:0    137# 2073* 2080* 2107*
RETRY   001322   555#  983* 1999  2001* 2851*
RSIZE   001320   554# 3606* 3618  4195* 4207  5756
SAVEA   040006  5845#
SAVREG= 104412  1237  1579# 1643
SDPAR0= 172260    269#
SDPAR1= 172262    270#
SDPAR2= 172264    271#
SDPAR3= 172266    272#
SDPAR4= 172270    273#
SDPAR5= 172272    274#
SDPAR6= 172274    275#
SDPAR7= 172276    276#
SDPDR0= 172220    247#
SDPDR1= 172222    248#
SDPDR2= 172224    249#
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SDPDR3= 172226            250#
SDPDR4= 172230            251#
SDPDR5= 172232            252#
SDPDR6= 172234            253#
SDPDR7= 172236            254#
SIPAR0= 172240            258#
SIPAR1= 172242            259#
SIPAR2= 172244            260#
SIPAR3= 172246            261#
SIPAR4= 172250            262#
SIPAR5= 172252            263#
SIPAR6= 172254            264#
SIPAR7= 172256            265#
SIPDR0= 172200            236#
SIPDR1= 172202            237#
SIPDR2= 172204            238#
SIPDR3= 172206            239#
SIPDR4= 172210            240#
SIPDR5= 172212            241#
SIPDR6= 172214            242#
SIPDR7= 172216            243#
SIZEHI= 177762            167#
SIZEJ   014500           3046    3132#
SIZELO= 177760            165#   3618    4207    5756
SR0   = 177572            185#
SR1   = 177574            186#
SR2   = 177576            187#
SR3   = 172516            188#
STACK = 001100             29#     30      31      32    2057
START   010000            434    1618    2051#   3157
STKLMT= 177774             37#
SUPSTK= 000700             31#
SWR   = 177570             39#     40     993*    1007    1009    1017    1024    1070    1073    1080    1084    1090    1097
                          1146    4750
SW0   = 000001            105#
SW00  = 000001             95#    105
SW01  = 000002             94#    104
SW02  = 000004             93#    103
SW03  = 000010             92#    102
SW04  = 000020             91#    101
SW05  = 000040             90#    100
SW06  = 000100             89#     99
SW07  = 000200             88#     98
SW08  = 000400             87#     97
SW09  = 001000             86#     96
SW1   = 000002            104#
SW10  = 002000             85#
SW11  = 004000             84#
SW12  = 010000             83#
SW13  = 020000             82#
SW14  = 040000             81#
SW15  = 100000             80#
SW2   = 000004            103#
SW3   = 000010            102#
SW4   = 000020            101#
SW5   = 000040            100#
```

```
SW6    = 000100            99#
SW7    = 000200            98#   1146
SW8    = 000400            97#
SW9    = 001000            96#   1097
SYSTID= 177764            169#
S0     = 000020            419#
SOMOM1= 000034            421#  4596
S1     = 000040            418#  4602
S1MOM1= 000054            420#  4594
TBIT   = 000020           1686#  1688  1691  1708
TBITO  = 104416           1581#  2832  3648  4237
TBITOF  005070            1581   1687#
TBITR  = 104420           1582#  2889  3892  4706
TBITRE  005116            1582   1706#
TBITVE= 000014             138#  2070* 2071*
TESTNO  001262             539#  1059* 5703  5705  5707  5710  5712  5714  5716  5719  5721  5723  5726
                          5729   5731  5733  5736  5738  5740  5741  5743  5745  5747  5750  5752  5754
                          5756   5758  5763  5769  5771  5773  5775  5778  5780  5782
TIMEOU  005152            1738#  2221
TIMOUT= 000020            2929#  2930  2970  3034  3093  3138  3352  3366  4170
TKVEC  = 000060             145#
TOFLAG  005154            1102*  1740#  1764*  2194*
TPVEC  = 000064             146#
TRAPVE= 000034             144#  2062* 2063*
TRTVEC= 000014             139#
TSLOC  = 040050           5847#  5848#  5849#  5850
TSTDAT  040050            4600   4615   4620   4660   5852#
TST1    011020            2217#
TST10   011654            2435   2477#
TST11   012054            2479   2539#
TST12   012200            2541   2565   2585#
TST13   012324            2587   2612   2629#
TST14   012450            2631   2656   2674#
TST15   012574            2676   2701   2718#
TST16   012720            2720   2745   2768#
TST17   013116            2770   2827#
TST2    011104            2219   2232   2249#
TST20   013540            2829   2923#
TST21   013714            2966#
TST22   014116            2968   3028#
TST23   014350            3030   3089#
TST24   014462            3091   3127#
TST25   015120            3129   3183   3225#
TST26   015314            3227   3262   3277#
TST27   015574            3279   3299   3347#
TST3    011162            2251   2263   2287#
TST30   015706            3349   3384#
TST31   016614            3386   3566#
TST32   017120            3568   3644#
TST33   017362            3646   3675   3700#
TST34   017634            3702   3732   3758#
TST35   020122            3760   3764   3803   3829#
TST36   020466            3831   3929#
TST37   020622            3935   3971#
TST4    011260            2289   2305   2322#
TST40   021536            3973   4157#
```

```
TST41    022042            4159    4233#
TST42    022304            4235    4264    4292#
TST43    022556            4294    4324    4353#
TST44    023044            4355    4359    4398    4427#
TST45    023332            4428    4432    4471    4487#
TST46    023466            4488    4526#
TST47    023626            4527    4568#
TST5     011350            2324    2339    2356#
TST6     011440            2358    2373    2390#
TST7     011530            2392    2407    2433#
TYPDS  = 104410            1191    1578#   4723    4730
TYPE   = 104400            1075    1083    1163    1165    1170    1172    1200    1216    1257    1278    1369    1464    1540
                           1574#   1615    2088    2162    2167    2169    2173    2175    4717    4724    4731
TYPOC  = 104402            1138    1185    1575#
TYPON  = 104406            1577#
TYPOS  = 104404            1576#
TYPVAD   003344            1208    1237#
T.END    010534            2137    2140#
T1       010366            2111#   2157
T2       010430            2118    2121#
T3       010462            2123    2126    2129#
T4       010514            2132    2135#
UBADDR   003452            1213    1269#
UBCOUN   005522            1864#   3064
UBMAP    020410            3835    3874    3891#
UDPAR0=  177660             225#
UDPAR1=  177662             226#
UDPAR2=  177664             227#
UDPAR3=  177666             228#
UDPAR4=  177670             229#
UDPAR5=  177672             230#
UDPAR6=  177674             231#
UDPAR7=  177676             232#
UDPDR0=  177620             203#
UDPDR1=  177622             204#
UDPDR2=  177624             205#
UDPDR3=  177626             206#
UDPDR4=  177630             207#
UDPDR5=  177632             208#
UDPDR6=  177634             209#
UDPDR7=  177636             210#
UIPAR0=  177640             214#
UIPAR1=  177642             215#
UIPAR2=  177644             216#
UIPAR3=  177646             217#
UIPAR4=  177650             218#
UIPAR5=  177652             219#
UIPAR6=  177654             220#
UIPAR7=  177656             221#
UIPDR0=  177600             192#
UIPDR1=  177602             193#
UIPDR2=  177604             194#
UIPDR3=  177606             195#
UIPDR4=  177610             196#
UIPDR5=  177612             197#
UIPDR6=  177614             198#
```

```
UIPDR7= 177616            199#
USESTK= 000600             32#
VCIP  = 010000            417#  4589
WRITEE  005272           1779#  2298  2332  2366  2400
$BDADR  001122            482#
$BDDAT  001126            484#
$BELL   001210            510#  1075  1107
$CHARC  004030           1379*  1386  1395* 1400#
$CLR.T  024556           4736   4739#
$CMTAG  001100            470#  2052  2053  2060  2066  2067  2068
$CM1  = 000006            496#   497#  498#  499#  500#  501#  502#
$CM2  = 000014            496#   497#  498#  499#  500#  501#  502#
$CM3  = 000006            494#   496
$CM4  = 000006            502#   503#  504#  505#  506#  507#  508#
$CRLF   001215            512#  1083  1107  1165  1172  1369  1403  4731
$DBLK   004476           1506   1540  1548#
$DB20   004750           1197   1254  1275  1643#
$DOAGN  024576           4713   4734  4741  4747#
$DTBL   004466           1509   1544#
$ENDAD  024566            457   1087  2086  4743#
$ENDCT  024414           2066   4715#
$ENULL  024644           4762#
$EOP    024346           4577   4582  4702#
$EOPCT  024406           2066*  4712#  4716
$ERFLG  001103            473#   973  1013  1015  1021*  1042  1067*  1107  1902
$ERMAX  001115            479#  1015  1037*  1042  2069*
$ERROR  002534           1058#  2060
$ERRPC  001116            480#  1077*  1078*  1079  1107  1137  5710  5714  5716  5719  5721  5729  5731
                         5736   5738   5740   5741  5743  5745  5750  5752  5754  5756  5758  5761  5765
                         5767   5769   5771   5773  5775  5778  5780  5782
$ERRTB  001334            582#  1156  1160
$ERTTL  001112            477#  1076*  1107  4728  4732*
$ESCAP  001206            509#  1036*  1093  1095  1107  2068*
$FILLC  001150            492#  1372  1403
$FILLS  001147            491#  1403
$GDADR  001120            481#
$GDDAT  001124            483#
$GET42  024540           4733#
$HD   = 000000             11
$ICNT   001104            474#  1028*  1029  1031*  1041
$ILLUP  004676           1589   1620#
$ITEMB  001114            478#  1079*  1107  1135
$LF     001216            513#  1107  1403
$LOOP   024636           4755   4759#
$LPADR  001106            475#  1019*  1034*  1039  1041  2002  2082*  2925*  3134*  3295*  3931*
$LPERR  001110            476#  1019  1035*  1041  1092  2083*  2223*  2229*  2254*  2260*  2293*  2302*  2327*
                         2336*  2361*  2370*  2395*  2404*  2440*  2452*  2461*  2490*  2504*  2516*  2545*  2562*
                         2591*  2609*  2635*  2653*  2680*  2698*  2724*  2742*  2772*  2784*  2790*  2797*  2805*
                         2838*  2865*  2880*  2926*  2931*  2952*  2971*  2986*  2993*  3000*  3007*  3035*  3057*
                         3071*  3094*  3110*  3135*  3233*  3296*  3335*  3356*  3369*  3392*  3407*  3422*  3437*
                         3452*  3467*  3482*  3497*  3512*  3527*  3542*  3553*  3580*  3617*  3658*  3674*  3713*
                         3716*  3731*  3802*  3873*  3932*  3940*  3953*  3981*  3996*  4011*  4026*  4041*  4056*
                         4071*  4086*  4101*  4116*  4131*  4142*  4169*  4206*  4247*  4263*  4305*  4308*  4323*
                         4397*  4470*
$MXCNT  002532           1032   1041#
$NULL   001146            490#  1374  1403
```

```
$NWTST= 000001        2207#  2209   2235#  2237   2275#  2277   2310#  2312   2344#  2346   2378#  2380   2420#
                      2422   2464#  2466   2522#  2524   2573#  2575   2617#  2619   2662#  2664   2706#  2708
                      2750#  2752   2808#  2810   2912#  2914   2955#  2957   3011#  3013   3075#  3077   3114#
                      3116   3210#  3212   3268#  3270   3338#  3340   3373#  3375   3556#  3558   3630#  3632
                      3686#  3688   3743#  3745   3814#  3816   3917#  3919   3957#  3959   4147#  4149   4219#
                      4221   4275#  4277   4335#  4337   4409#  4411   4482#  4484   4521#  4523   4562#  4564
$OCNT   004256        1436*  1465*  1478#
$OCTVL  005052        1645   1670#
$OMODE  004260        1431*  1435*  1440   1443*  1454*  1480#
$OVER   002516         994   1012   1020   1030   1038#
$PASS   001100         471#  1026   1042   3182   4709*  4710*  4721   4761
$PWRAD  004672        1618#
$PWRDN  004550        1589#  1613   2064
$PWRMG  004666        1616#
$PWRUP  004616        1598   1603#
$QUES   001214         511#  1107
$RDCHR= ****** U      1579
$RDDEC= ****** U      1579
$RDLIN= ****** U      1579
$RDOCT= ****** U      1579
$REGAD  001152         494#
$REG0   001154         496#  1061*  4497*  4504*  4511*  4632*  4667*  5710   5719   5729   5736   5745   5761
                      5765   5767   5769   5771   5773   5775   5778   5780   5782
$REG1   001156         497#  1062*  4498*  4505*  4512*  4633*  4668*  4669*  5721   5731   5738   5752   5754
                      5761   5765   5767   5773   5778
$REG2   001160         498#  1063*  4551*  4634*  4670*  5719   5752   5754   5763   5765   5767   5775   5778
                      5782
$REG3   001162         499#  1064*  5721   5754   5775   5780   5782
$REG4   001164         500#  1065*  5736   5775
$REG5   001166         501#  1066*
$RESRE  003562        1318#  1580
$RTRN   024634        2070   2072*  2077*  4737   4756#
$SAVRE  003524        1302#  1579
$SAVR6  004702        1597*  1603   1604*  1605*  1622#
$SCOPE  002214         982#  2058
$SETUP= 000037         423#  1084   2058   2060   2062   2064   2066   2067   2068   2070   2082   2086   4707
$STUP = 177777         423#
$SVLAD  002470        1002   1033#
$SVPC = 000204         455#   460
$SWR  = 177400           1#    11     16     17     18     19     20     21     22     23    508    509    510
                       974    975    976    977    978    993   1005   1007   1008   1013   1014   1015   1022
                      1023   1024   1035   1038   1041   1049   1050   1051   1052   1053   1054   1070   1073
                      1080   1084   1090   1107   2067   2068   2070   2082   2083   2221   2253   2291   2326
                      2360   2394   2437   2481   2543   2589   2633   2678   2722   2772   2831   2929   2970
                      3032   3093   3131   3229   3281   3351   3388   3570   3648   3704   3762   3833   3935
                      3975   4161   4237   4296   4357   4428   4488   4527   4569   4698   4708   4735   4748
                      4761
$SWRMK= 000200           1#    23     24    978    979   1009   1010
$TBIT   024642        2081*  4752*  4761#
$TIMES  001204         508#  1022*  1029   1032*  1041   2067*  2437*  2481*  2543*  2589*  2633*  2678*  2722*
                      2831*  3032*  3131*  3229*  3570*  4161*  4569*  4708*
$TKB    001140         487#
$TKS    001136         486#  2055
$TMP0   001170         502#  1785   1786*  1787   1788*  2296*  2330*  2364*  2398*  3231*  3248*  3252   3255*
                      5710   5771
$TMP1   001172         503#  4552*  5763
```

```
$TMP2   001174          504#  4553*  5763
$TMP3   001176          505#
$TMP4   001200          506#  3649*  3668  3704*  3725  3766*  3795  3837*  3866  4238*  4257  4296*  4317
                       4361*  4390  4434*  4463  5758
$TMP5   001202          507#  2833*  2881  3652*  3673  3707*  3730  3765*  3801  3836*  3872  4241*  4262
                       4299*  4322  4360*  4396  4433*  4469
$TN   = 000050            1#    11  2207  2218  2221#  2232  2235  2250  2253#  2263  2275  2288  2291#
                       2305  2310  2323  2326#  2339  2344  2357  2360#  2373  2378  2391  2394#  2407
                       2420  2434  2437#  2464  2478  2481#  2522  2540  2543#  2565  2573  2586  2589#
                       2612  2617  2630  2633#  2656  2662  2675  2678#  2701  2706  2719  2722#  2745
                       2750  2769  2772#  2808  2828  2831#  2912  2923  2929#  2955  2967  2970#  3011
                       3029  3032#  3075  3090  3093#  3114  3128  3131#  3132  3183  3210  3226  3229#
                       3262  3268  3278  3281#  3299  3338  3348  3351#  3373  3385  3388#  3556  3567
                       3570#  3630  3645  3648#  3675  3686  3701  3704#  3732  3743  3759  3762#  3764
                       3803  3814  3830  3833#  3917  3929  3935#  3957  3972  3975#  4147  4158  4161#
                       4219  4234  4237#  4264  4275  4293  4296#  4324  4335  4354  4357#  4359  4398
                       4409  4428#  4432  4471  4482  4488#  4521  4527#  4562  4569#
$TPB    001144          489#  1392*  1403
$TPFLG  001151          493#  1352  1403
$TPS    001142          488#  1390  1403
$TRAP   004506         1558#  2062
$TRP  = 000022         1565#  1575#  1576#  1577#  1578#  1579#  1580#  1581#  1582#  1583#
$TRPAD  004526         1562  1573#
$TSTNM  001102          472#   973  1011  1033*  1038  1042  1059  1069  1107  2927*  2928  3136*  3137
                       3933*  3934  4707*
$TYPBN= ****** U       1579
$TYPDS  004262         1494#  1578
$TYPE   003620         1352#  1565  1574
$TYPEC  003764         1371  1378  1385  1390#  1391
$TYPEX  004032         1396  1398  1401#
$TYPOC  004060         1434#  1575
$TYPON  004074         1433  1436#  1577
$TYPOS  004034         1429#  1576
$XTSTR  002266          996#
$$GET4= 000001         4735#  4740
$$TRP = 000002         1564#  1575  1576  1577  1578  1579  1580  1581  1582  1583
$OFILL  004257         1430*  1434*  1444  1479#
.     = 042050          426#   430   432#   455   456#  458#  460#  468#  514  1041  1042  1107  1224#
                       1403  1548#  1600  1621  1670#  2049#  2056  2082  2083  2091#  4546  4720#  4761
                       4763#  5845#  5847  5850#  5852#
```

```
AND          1#   1756   1782   1786   1809   1813   1835   1839   1843   1866   1870   1895   1899   3317   3321
COMMEN       1#    415#
COUNT1       1#   2590   2634   2679   2723
DONE         1#   4703
ENDCOM       1#    415#
ENTRY        1#   2923   3132   3929
ERROR       33#   1753   1761   1763   1791   1793   1818   1820   1848   1850   1875   1877   1904   1906   1944
            1946   1989   1998   2037   2233   2264   2306   2340   2374   2408   2446   2460   2498   2515   2566
            2613   2657   2702   2746   2783   2789   2796   2804   2850   2879   2945   2982   2992   2999   3006
            3045   3069   3109   3156   3178   3188   3254   3263   3328   3330   3334   3368   3402   3417   3432
            3447   3462   3477   3492   3507   3522   3537   3552   3601   3625   3670   3727   3798   3869   3952
            3991   4006   4021   4036   4051   4066   4081   4096   4111   4126   4141   4190   4214   4259   4319
            4393   4466   4499   4506   4513   4554   4635   4671
ESCAPE       1#    415#
MAPADD       1#   3392   3407   3422   3437   3452   3467   3482   3497   3512   3527   3542   3981   3996   4011
            4026   4041   4056   4071   4086   4101   4116   4131
MSG1        2207#  2209
MSG10       2464#  2466
MSG11       2522#  2524
MSG12       2573#  2575
MSG13       2617#  2619
MSG14       2662#  2664
MSG15       2706#  2708
MSG16       2750#  2752
MSG17       2808#  2810
MSG2        2235#  2237
MSG20       2912#  2914
MSG21       2955#  2957
MSG22       3011#  3013
MSG23       3075#  3077
MSG24       3114#  3116
MSG25       3210#  3212
MSG26       3268#  3270
MSG27       3338#  3340
MSG3        2275#  2277
MSG30       3373#  3375
MSG31       3556#  3558
MSG32       3630#  3632
MSG33       3686#  3688
MSG34       3743#  3745
MSG35       3814#  3816
MSG36       3917#  3919
MSG37       3957#  3959
MSG4        2310#  2312
MSG40       4146#  4149
MSG41       4219#  4221
MSG42       4275#  4277
MSG43       4335#  4337
MSG44       4409#  4411
MSG45       4481#  4484
MSG46       4520#  4523
MSG47       4562#  4564
MSG5        2344#  2346
MSG6        2378#  2380
MSG7        2420#  2422
MULT           1#   415#
```

```
NEWTST     1#   415#  2207  2235  2275  2310  2344  2378  2420  2464  2522  2573  2617  2662  2706
          2750  2808  2912  2955  3011  3075  3114  3210  3268  3338  3373  3556  3630  3686  3743
          3814  3917  3957  4147  4219  4275  4335  4409  4482  4521  4562
POP        1#   415#  1323  1535  1607
PUSH       1#   415#  1303  1494  1591
SAVTST     1#  1059
SCOPE     34#  2218  2250  2288  2323  2357  2391  2434  2478  2540  2586  2630  2675  2719  2769
          2828  2882  2924  2967  3029  3090  3128  3133  3226  3278  3348  3385  3567  3645  3701
          3759  3830  3891  3930  3972  4158  4234  4293  4354  4427  4487  4526  4568  4703
SETTRA  1565#  1575  1576  1577  1578  1579  1580  1581  1582
SETUP      1#   415#  2051
SKIP       1#   415#  2232  2263  2305  2339  2373  2407  2565  2612  2656  2701  2745  3183  3262
          3299  3675  3732  3764  3803  3835  3874  4264  4324  4359  4398  4432  4471
SLASH      1#   415#
SPACE    415#
SSCOPE     1#   983  2851
STARS      1#   415#   435   461   566   967  1042  1284  1330  1403  1481  1549  1584  1631  2207
          2216  2235  2248  2275  2286  2310  2321  2344  2355  2378  2389  2420  2432  2464  2476
          2522  2538  2573  2584  2617  2628  2662  2673  2706  2717  2750  2767  2808  2826  2912
          2922  2955  2965  3011  3027  3075  3088  3114  3126  3210  3224  3268  3276  3338  3346
          3373  3383  3556  3565  3630  3643  3686  3699  3743  3757  3814  3828  3917  3928  3957
          3970  4147  4156  4219  4232  4275  4291  4335  4352  4409  4426  4482  4486  4521  4525
          4562  4567  4690
TRACK      1#  2217  2249  2287  2322  2356  2390  2433  2477  2539  2585  2629  2674  2718  2768
          2827  2966  3028  3089  3127  3225  3277  3347  3384  3566  3644  3700  3758  3829  3971
          4157  4233  4292  4353
TRACK1     1#  2218  2250  2288  2323  2357  2391  2434  2478  2540  2586  2630  2675  2719  2769
          2828  2967  3029  3090  3128  3226  3278  3348  3385  3567  3645  3701  3759  3830  3972
          4158  4234  4293  4354
TRMTRP  1565#
TYPBIN     1#   415#
TYPDEC     1#   415#  4721  4728
TYPNAM     1#   415#  2084
TYPNUM     1#   415#
TYPOCS     1#   415#
TYPOCT     1#   415#
TYPTXT     1#   415#  4717  4724
USER       1#   514
ZEROER     1#  1097
$$CMRE   461#   496   497   498   499   500   501
$$CMTM   461#   502   503   504   505   506   507
$$ESCA     1#   415#
$$NEWT     1#   415#  2207  2235  2275  2310  2344  2378  2420  2464  2522  2573  2617  2662  2706
          2750  2808  2912  2955  3011  3075  3114  3210  3268  3338  3373  3556  3630  3686  3743
          3814  3917  3957  4147  4219  4275  4335  4409  4482  4521  4562
$$SET   1565#  1575  1576  1577  1578  1579  1580  1581  1582
$$SETU  2070#
$$SKIP     1#   415#  2232  2263  2305  2339  2373  2407  2565  2612  2656  2701  2745  3183  3262
          3299  3675  3732  3764  3803  4264  4324  4359  4398  4432  4471
.EQUAT     1#
.HEADE     1#
.KT11      1#
.SETUP     1#   423
.SWRHI     1#    11
.SWRLO    24#
.$ACT1     1#   435
```

```
.$CATC      1#    423
.$CMTA      1#    461
.$DB2D      1#
.$DB2O      1#   1631
.$DIV       1#
.$EOP       1#   4690
.$ERRO      1#   1042
.$ERRT      1#
.$MULT      1#
.$POWE      1#   1584
.$RAND      1#
.$RDDE      1#
.$RDOC      1#
.$READ      1#
.$SAVE      1#   1284
.$SB2D      1#
.$SB2O      1#
.$SCOP      1#    967
.$SIZE      1#
.$SUPR      1#
.$TRAP      1#   1549
.$TYPB      1#
.$TYPD      1#   1481
.$TYPE      1#   1330
.$TYPO      1#   1403
.1170       1#     25


. ABS.  042050     000

 ERRORS DETECTED:  0

 DSKZ:CEKBFC.BIN,DSKZ:CEKBFC.LST/CRF/SOL=CEKBFC.SML,CEKBFC.P11
 RUN-TIME: 50 73 5 SECONDS
 RUN-TIME RATIO: 785/131=5.9
 CORE USED:  34K  (67 PAGES)
```