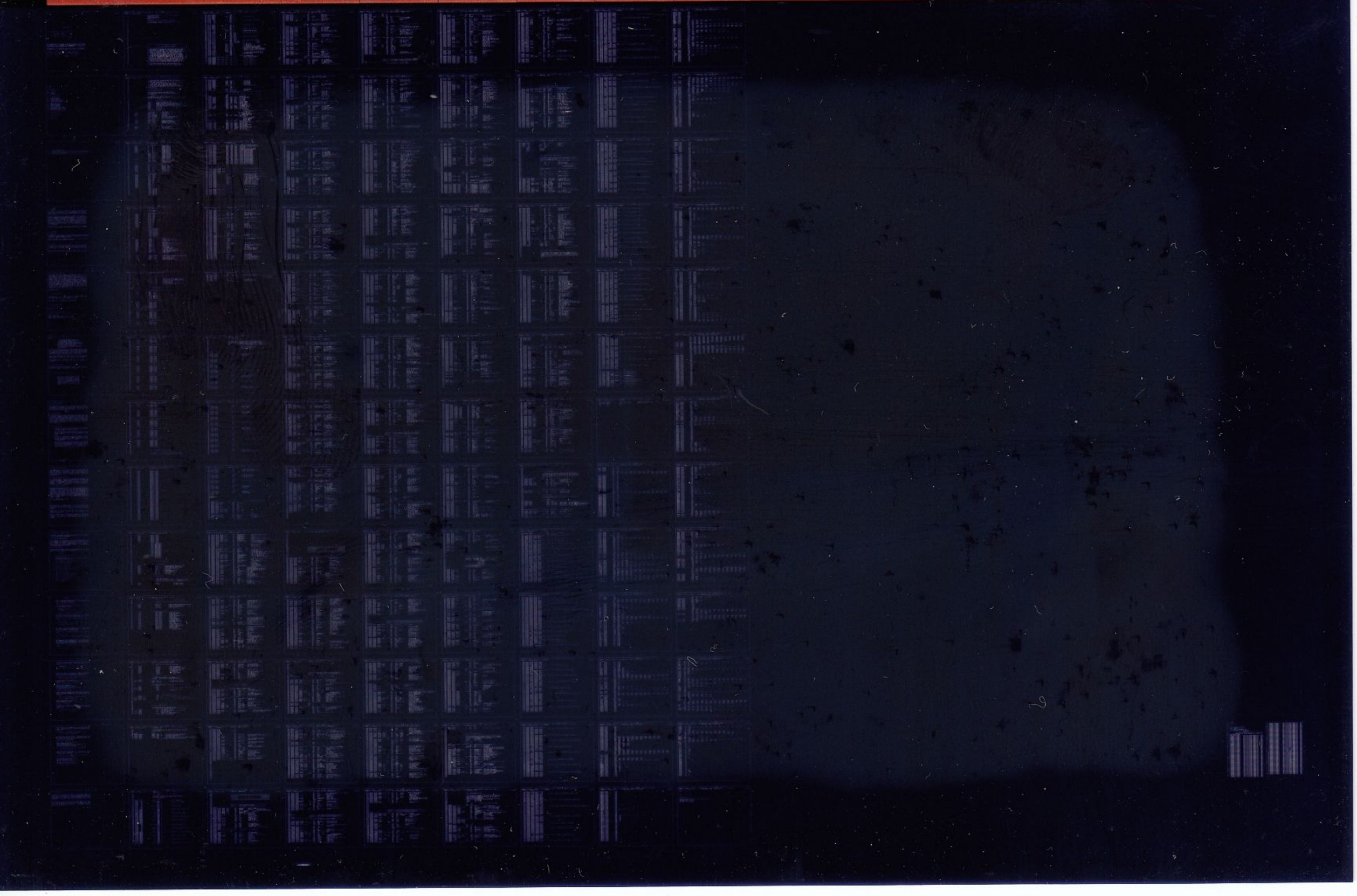
PDP11-70/74 11/70 POW FAIL
CEKBGCO

AH-7984C-MC
FICHE 1 OF 1



.REM @

SEQ 0001

IDENTIFICATION

PRODUCT CODE: AC-7983C-MC
PRODUCT NAME: CEKBGC0 11/70 Pow Fail
PRODUCT DATE: MAY,1980
MAINTAINER: Diagnostic Engineering

CONTENTS

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        REVISION HISTORY
*****************************************************************************
REVCO:  MODIFIED TESTS 17,20 AND 21 TO UTILIZE 'ASRB' LOCKS IN ACCORDANCE
        WITH SPECIFIED CONSTRUCTION.
*****************************************************************************
```

1.0 ABSTRACT

This diagnostic serves as a replacement to DEKBGA, the 11/70 Power Fail Test. It provides all of the coverage and features of the previous power fail test along with the added features of diagnostic support for multiprocessor systems using the KB11-CM Processor and the IIST interface.

The test is divided into two sections, Section 1 and Section 2. Section 1 completely replaces DEKBGA and basically serves as a test of CPU logic validity during a power Fail sequence. This section can be run on a standard unmodified 11/70 processor as it utilizes no multiprocessor resources. Section 2 is enabled by enabling console switch 6. This section will be executed directly after section 1. This section provides testing for proper functionality of the Interprocessor Interrupt and Sanity Timer (IIST) powerfail procedures, and memory system activity during a loss of power on the system or one of its subsystems.

This diagnostic also supports the use of the UNIBUS Exerciser (UBE) to perform simulated powerfail sequences during the execution of Section 1.

2.0 REQUIREMENTS

2.1 Equipment

THIS DIAGNOSTIC IS DESIGNED TO TEST PDP-11/70 SYSTEMS USING THE KB-11B/C PROCESSOR. A CONSOLE TERMINAL IS REQUIRED FOR MESSAGE AND ERROR REPORTING. A UNIBUS EXERCISER MAY OPTIONALLY BE USED.

NOTE: THIS DIAGNOSTIC ALSO SUPPORTS THE PDP-11/74, AN IN-HOUSE, EXPERIMENTAL PROCESSOR IN BOTH STANDALONE AND MP MODES.

2.2 Storage

The Power Fail test runs in 12K words of memory. The first 4K is used for stack areas and common access data. The second 4K contains the program itself. The only data elements that reside here are type and error messages, and execution flow and control variables that are used

(modified) when the processor runs in multiprocessor mode. The next 4K is used as buffer space for massbus transfers that occur during test 21.

2.3 Preliminary Procedures.

All standard 11/70-74 CPU diagnostics should first be run to insure proper operation under a secure power condition. Specifically, the IIST diagnostic and Unibus Exerciser diagnostics should be run. If massbus devices are to be used for test 21 it might be wise to insure that the devices are in proper working order. The power fail diagnostic may use all massbus drives and memory boxes accessible by the CPUs participating in this diagnostic. Therefore, it is important to switch offline to participating CPUs all data storage equipment that the operator does not want corrupted by this diagnostic. Before starting the power-fail diagnostic the operator should also be sure that the CPU power-up action switches (on the IIST front panel) are all "Run or Halt" for participating CPUs, the IIST enable switches are "online", and the IIST configuration switches are all at the same system for all participating CPUs. All participating memory boxes should be online to all participating CPUs.

The operator of this test should be familiar with the MKA11 and IIST boot/control panel.

3.0 LOADING PROCEDURE

This diagnostic can be loaded within the standard XXDP loading procedure. Note that if this diagnostic is being run as part of a chain that it must be the last element in that chain.

This diagnostic is loadable under the APT system but can only be run under APT in Uniprocessor mode with the UBE enabled.

4.0 STARTING PROCEDURE

4.1 Starting Address

The starting address for this diagnostic is 200. The restart address is 220.

4.2 Control Switch Settings

The switch settings are as follows (when set to 1):

SW15 - Halt on Error
SW14 - Loop on test (Section 1 only)
SW08 - Enable System Power Fail Test (Test 25)
SW07 - Disable Section 1 Tests (Multiprocessor mode only)

SW6	SW5	
0	0	Uniprocessor mode, manual powerfail. (this mode can be used a a replacement for previous powerfail diagnostic)
0	1	Uniprocessor mode, automatic (UBE) powerfail (uniprocessor mode that should be used under APT)
1	0	Multiprocessor mode, manual powerfail. Both sections (1 and 2) are executed.
1	1	Multiprocessor mode, automatic (UBE) powerfail. Only Section 1 will use the UBE. Each CPU must have a UBE.

Note that for the multiprocessor modes (SW6 enabled) the IIST "system" ID of each CPU participating in the test should be specified by setting the appropriate bit in Switches 0-3 in the switch register. For example, if all processors in a 4 processor system are to be tested then switches 0-3 should be enabled. If only CPU's 0 and 2 are to participate then only switches 0 and 2 should be enabled.

The switches are defined by the master CPU only (in multiprocessor mode), where the master is the CPU that starts or restarts the program. Each slave CPU uses the switch definitions of the master.

The Program will not interpret changes to the switches in multiprocessor mode while the program is running. The program must be restarted.

4.3 Restarting Procedures

The restart address for this diagnostic is 220. A restart should be considered a completely new session therefore be sure the proper switches are enabled for the features that you want.

4.4 Program And/Or Operator Action

NOTE

Be sure to isolate the CPU's that are to participate in the powerfail test from other CPU's that are to remain functional. Participating CPU's should have the IIST configuration switches found on the IIST panel switched to the SYSTEM B position (if this is the default position for the installation then the SYSTEM A position could be used).

5.0 OPERATING PROCEDURES

5.1 Modes Of Operation

This diagnostic is designed to run in four basic modes specified by the selection of bits 5 & 6 in the console switch register. It should be noted that if a multiprocessor mode is chosen (SW6 enabled) that the first CPU started will become the "master" and successively start the remaining participating CPU's, the "Slaves".

5.2 Common Procedures

Load address 200 and then enable the switches for the test mode that is desired. Remember to enable the appropriate CPU mask bit if you are running a multiprocessor mode. When this has been done insure that all slaves are powered up and have their halt switches in the "enable" state if MP mode is to be used. Hit start - the program name will be typed followed by the mode the diagnostic is running in (uniprocessor or multi-processor) followed by the contents of the switch register and whether the Unibus Exerciser will be used to simulate power fails.

5.3 Notes And Warnings

1. Power failures in section 1 are only allowed when expected. Therefore in manual mode do not remove the power until the test number appears in the display register.

2. Power failures are not allowed during the execution of the End of Pass (EOP) routines. Note that the number displayed during the End of Pass is the Pass number NOT the test number.

3. When running the diagnostic in uniprocessor mode on a single CPU that is part of a multiprocessor system make sure that the IIST configuration switch for the respecitve CPU is in the STAND ALONE position and the IIST ENABLE switch is in the OFF LINE position.

4. When running in multiprocessor mode insure that the subsystem under test is isolated from any system that is still running by switching the CPU's under test to an alternate postion with the IIST CONFIGURATION swtiches. For example, if the default system normally runs on the "SYSTEM A" postion, switch the subsystem under test to the "SYSTEM B" position.

5.4 Uniprocessor Mode, No UBE

The diagnostic will instruct you to "interrupt the power after the test number appears on the display". Interrupt the power only at this time. If the test is successful then the next test number should appear in the display. When the End of Pass is reached the Pass count will be typed. There are no error reports in Section 1 (except for unexpected traps to 4 and 114.) Normally, an error results in a processor halt.

5.5 Uniprocessor Mode, With UBE

In this mode the UBE is used to perform the power Fail procedure. No "interrupt the power..." message is typed before the UBE takes action. The test number and pass number however do appear in the display register. An EOP message is typed equivalent to that of Section 5.4. Note that in this mode only the CPU logic involved in the power-fail sequence is tested. Failures that may occur because of problems in the Power system will go undetected.

5.6 Multiprocessor Mode, No UBE

In multiprocessor mode the CPU that is initially started becomes the 'MASTER' CPU. What this means is that all error messages and typeouts will appear on this CPU's console. This CPU is also responsible for startup of "slave" CPU's. Slave CPU's are the remaining CPU's that are scheduled to participate in the test by their appropriate bit being set in switches 0-3 of the master CPU's SWR. When start is depressed and multi-processor mode is specified the program name, test mode, and switch register setting will be typed upon the master CPU console. The remaining CPU's will then be booted and then interrupted through the masters IIST. This will be followed by an "interrupt the power..." message.

The ID of the processor responsible for typeouts and error messages will precede the message:

0>
1>
n>

Run each processor through section 1 one at a time. After power-failing the last test in Section 1 (Test 16) on one CPU go on to the next CPU, etc. After the last test on the last CPU has been completed in Section 1, the operator will receive instructions at console.

Whereas there are no prompts printed at the console in Section 1, all power fails in Section 2 must be done in exact agreement with the typed-out instructions.

Section 2 prompts the operator to remove the power from a particular element of the system. If the expected results occur then the next element is tried. When all relevant elements have been tried then the diagnostic precedes to the next test. Section 2 contains tests 17 through 25.

5.7 Multiprocessor Mode, With UBE

This mode is the same as "multiprocessor mode, no UBE" except that Section 1 will be done without manual intervention. ALl CPUs that are to participate must have a UBE module.

6.0 ERRORS AND ERROR REPORTING

Error reports are always typed out on the console of the CPU that was first started. This is the "master" CPU in multiprocessor mode. All error messages are preceded by a tag as follows 'n>' where n's the IIST self-ID of the CPU encountering the error. Typing in multiprocessor mode is always done by the master. If the master is without power when typing is required, the messages will be queued and printed when power has been restored.

7.0 TEST DESCRIPTIONS

The tests that are found in section I are simple power fail tests that guarantee that the proper machine states are entered on power fail and power up. The test names are self- explanatory.

Section 1

1. Simple Down/Up test (Kernal node)
2. Program Voltility Test
   Verify that the memory bank containing the program will not be corrupted by CPU power fails.
3. Simple Down/Up test (Supervisor mode)
4. Simple Down/Up Test (User mode)
5. Power fail with odd address
6. Power Fail in the Red Zone
7. Power Fail with memory timeout (kernal)
10. Power Fail in the yellow zone.
11. Power Fail with resets.
12. Power Fail with odd address (Supervisor).
13. Power Fail with Timeout (Supervisor)
14. Power Fail with odd address (User)
15. Power Fail with timeout (User)
16. Memory Management Abort Test

Section 2

After all CPUs reach the beginning of Section 2, each CPU sizes for RP04/5/6 massbus devices. If no devices are found the following message is printed:

No Massbus Device Available On CPU #n

If the only massbus device found has its PGM bit set, the following message is printed:

Warning: Drive #n
On CPU #n
Is accessible over Ports A and B

and will be used later in this diagnostic.

17. Check 'BRK" & 'DCF" FLAGS during power fail. Insure that the IIST's of functioning CPU's receive BRK & DCF signals corresponding to the CPU that performed a Power Fail.

The operator will be prompted with messages of the following type:

Power Fail CPU #n

After restoring power, each of the other CPUs should report:

CPU Interrupt As Expected

20. Check power fail during high memory activity. Insure that power down sequences can be performed by a CPU while other CPU's are contending for the memory bus.

The operator will be prompted with messages of the following type:

Power Fail CPU #n

There is no report from the other CPUs after restoring power.

21. Check power fail during massbus transfer. Insure that power down sequences can be performed by a CPU while other CPU's are performing massbus read operations. Also verify that the read operations don't experience any loss of data due to the power condition of an uninvolved CPU.

The operator will be prompted with messages of the following type:

Power Fail CPU #n

If there are no massbus devices for the other CPUs to use, then the following messages are printed instead of the above message:

No Massbus Device Available On CPU #n Proceeding
To Next CPU.

There is no report from the other CPUs after restoring power.

22. Insure that a loss of AC power on a MKA11 semiconductor memory box does not cause a power fail sequence to occur on any processor that has a disabled part to that box.

The operator will be prompted with messages of the type:

Get Set To Power Fail Mem Box #n

Put battery backup on all memory boxes
Make all memory ports offline only on mem box to be power failed
Make all CPU power-up switches 'Run or Halt''

Now Power Fail The Mem Box
Restore power 5 seconds after power fail
Restore all memory ports online
Then type any character at the master console
No CPU should report a power fail

The master should report ''OK''.

23. Check AC power fail on memory box. Insure that a loss of AC power on a MKA11 semiconductor memory box causes a power fail sequence to occur on any processor that has an enabled port to that box.

The operator will be prompted with message of the type:

Get Set To Power Fail Mem Box #n

Put battery backup on all memory boxes
Make all memory ports online
Make all CPU power-up switches 'Run or Halt''

Now power fail the mem box

Restore power 5 seconds after power fail then type any character at the master console. Each CPU should report a power failure.

Each CPU should report the following message:

Power Failure On CPU As Expected

24. Check DC Power Loss on a memory box. Insure that the slave CPU(s) specified through the IIST Boot/control panel perform a boot operation when AC & DC power are restored to the memory box.

    The operator will be prompted with message of the type:

        Get Set To Power Fail Mem Box #n

    Disable battery backup on mem box to be power-failed. Put all slave CPU mem ports online. Make master CPU mem port offline only on box to be power-failed. Make all CPU power-up switches 'RUN OR Boot'.

    Now Power Fail The Mem Box

    Restore power 5 seconds after power fail
    Restore all mem ports online
    Restore all CPU power-up switches to 'Run or Halt''
    Then type any character at the master console
    Each slave should report an interrupt

    Each slave CPU should report the following message:

        CPU Interrupt As Expected

25. Check system recovery on power fail. Insure that a total momentary loss of AC power on a system level is recoverable without operator intervention.

    The operator will be prompted with the following message:

    Get Set to Power Fail Entire System...

    Put battery backup on all mem boxes
    Make all memory ports online
    Make all CPU power-up switches 'Run or Halt''

    Now Power Fail the Entire System
    Restore power 5 seconds after power fail

    Each CPU should report the following:

8.0 MISCELLANEOUS

Test 24 will not be done on the memory box with base address 0. Therefore, in order to fully test all system elements the operator should restart this diagnostic a second time and switch the box with base address 0 with another box (using the thumbwheels to switch base addresses). The operator should also switch master CPUs on the restart.

Test 22 will be skipped if there is only one MKA11 memory box. Power Failing through Section 1 with the UBE will not necessarily test power fail during odd address trap, timeout, etc. (it depends on when the UBE starts the power down). Therefore, it is recommended to manually power fail Section 1!

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```
                        .TITLE  MAINDEC-11-CEKBG-C      PDP-11/70 SYSTEM  POWER FAIL
                        ;*COPYRIGHT (C) 1978
                        ;*DIGITAL EQUIPMENT CORP.
                        ;*MAYNARD, MASS. 01754
                        ;*
                        ;*PROGRAM BY JIM LACEY, JEFF WHITE, BILL SCHLITZKUS
                        ;*
                        ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                        ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                        ;*
```

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;;*************************************************************************
;;*                                                                       *
;;*                    11-70/74 SYSTEM POWER FAIL DIAGNOSTIC              *
;;*                    -------------------------------------              *
;;*                                                                       *
;;*  THIS DIAGNOSTIC IS DIVIDED INTO TWO SECTIONS: SECTION 1 TESTS THE    *
;;* BASIC ABILITY OF A PROCESSOR TO SUCCESSFULLY ENTER AND RECOVER        *
;;* FROM A POWER FAIL CONDITION.  THIS SECTION REPLACES, IN FUNC-         *
;;* TIONALITY, THE PREVIOUS POWER FAIL DIAGNOSTIC DEKBGA AND PROVIDES     *
;;* EQUIVALENT DIAGNOSTIC COVERAGE.  THIS SECTION AND ONLY THIS           *
;;* SECTION  WILL BE RUN IF THE MP SWITCH (SWITCH 6) IS DISABLED.         *
;;*     SECTION 2 OF THIS DIAGNOSTIC PROVIDES DIAGNOSTIC COVERAGE        *
;;* FOR MULTIPROCESSOR CONFIGURATIONS UTILIZING THE IIST INTERFACE        *
;;* AS A MEANS OF INTERPROCESSOR COMMUNICATION.  IF THE MP SWITCH         *
;;* (SWITCH 6) IS ENABLED BOTH SECTION 1 AND SECTION 2 ARE PERFORMED,     *
;;* ALSO THE IIST IS USED IN SECTION 1 TO INITIALIZE AND START ALL        *
;;* PARTICIPATING PROCESSORS.  SECTION 2 TESTS THE ABILITY OF A MULTI-    *
;;* PROCESSOR SYSTEM TO SUCCESSFULLY RECOVER FROM A POWER FAILURE         *
;;* EITHER IN A SELECTIVE SUBSYSTEM (MEMORY BOX OR PROCESSOR) OR ON       *
;;* A SYSTEM WIDE LEVEL DURING VARIOUS KINDS OF MEMORY AND I/O ACTIV-     *
;;* ITY.                                                                  *
;;*  IN THE MULTIPROCESSOR MODE, ALL CPUS MUST ARRIVE AT THE              *
;;* ENTRY POINT TO SECTION 2 BEFORE ANY CPU WILL BEGIN SECTION 2          *
;;* TESTING.  IF SECTION 1 IS NOT SKIPPED AND THE UNIBUS EXCERCISER       *
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                        ;;* IS NOT BEING USED, THE OPERATOR MUST POWER FAIL EACH CPU          *
                        ;;* MANUALLY THRU THE 16 TESTS OF SECTION 1 TO GET THE CPU TO THE     *
                        ;;* ENTRY POINT OF SECTION 2.                                         *
                        ;;*     BEFORE STARTING THE PROGRAM, BE SURE THAT THE CPU POWER-UP     *
                        ;;* ACTION SWITCHES (ON THE IIST FRONT PANEL) ARE ALL                 *
                        ;;* 'RUN OF HALT'', THE IIST ENABLE SWITCHES ARE ONLINE, AND          *
                        ;;* THE IIST CONFIGURATION SWITCHES ARE EITHER ALL SYSTEM 0 OR 1.     *
                        ;;* ALL PARTICIPATING MEMORY BOXES SHOULD BE ONLINE TO ALL PARTIC-    *
                        ;;* IPATING CPUS.                                                     *
                        ;;*********************************************************************

                        ;SWITCH REGISTER DEFINITIONS
                        ;
                        ;THE SWITCHES ARE DEFINED BY THE MASTER CPU ONLY,
                        ;WHERE THE MASTER IS THE CPU THAT STARTS OR RESTARTS
                        ;THE PROGRAM.  EACH SLAVE CPU USES THE SWITCH DEFINITIONS
                        ;OF THE MASTER.
                        ;
                        ;THE PROGRAM WILL NOT INTERPRET CHANGES TO THE
                        ;SWITCHES IN MULTIPROCESSOR MODE WHILE THE PROGRAM IS RUNNING.  THE
                        ;PROGRAM MUST BE RESTARTED.
                        ;
                        ;SW15=1          HALT ON ERROR

                        ;SW14=1          LOOP ON TEST (SECTION 1 ONLY)
                        ;SW08=1          ENABLE SYSTEM POWER FAIL TEST (TEST 25)
                        ;SW07=1          DISABLE SECTION 1 TESTS (MULTIPROCESSOR MODE ONLY)
                        ;SW06=1          ENABLE MULTIPROCESSOR MODE/SECTION 2 TESTS
                        ;SW05=1          ENABLE UNIBUS EXERCISERS (SECTION 1 ONLY, EACH CPU MUST HAVE A UBE)
                        ;SW03=1          TEST CPU #3 (IIST SELF ID), MULTIPROCESSOR MODE ONLY
                        ;SW02=1          TEST CPU #2          ''                    ''
                        ;SW01=1          TEST CPU #1          ''                    ''
                        ;SW00=1          TEST CPU #0          ''                    ''
                        .SBTTL  BASIC DEFINITIONS

                        ;*INITIAL ADDRESS OF THE STACK POINTER
013776                  STACK=  13776           ;;FIRST ADDRESS OF THE STACK
013776                  KERSTK= STACK           ;;KERNEL STACK
013576                  SUPSTK= STACK-200       ;;SUPERVISOR STACK
013476                  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                  DSWR=   177570          ;;HARDWARE SWITCH REGISTER
177570                  DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
177546                  LKS=    177546          ;;LINE CLOCK (KW11-L) STATUS REGISTER

                        ;*MISCELLANEOUS DEFINITIONS
000011                  HT=     11              ;;CODE FOR HORIZONTAL TAB
000012                  LF=     12              ;;CODE LINE FEED
000015                  CR=     15              ;;CODE CARRIAGE RETURN
000200                  CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
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                                ;*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
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                                .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
002000                          BIT10=  2000
001000                          BIT09=  1000
000400                          BIT08=  400
000200                          BIT07=  200
000100                          BIT06=  100
000040                          BIT05=  40
000020                          BIT04=  20
000010                          BIT03=  10
000004                          BIT02=  4
000002                          BIT01=  2
000001                          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
000100                          LKVEC=  100             ;;LINE CLOCK (KW11-L) VECTER
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
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                        .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
177764                  SYSTID = 177764         ;;SYSTEM ID REGISTER
177766                  CPUERR = 177766         ;;CPU ERROR REGISTER HOLDS CONDITION THAT CAUSED
                                                ;;THE TRAP TO ERRVEC (000004)


                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*MEMORY MANAGEMENT STATUS REGISTER ADDRESSES

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

                        ;*USER "I" PAGE DESCRIPTOR REGISTERS

177600                  UIPDR0= 177600
177602                  UIPDR1= 177602
177604                  UIPDR2= 177604
177606                  UIPDR3= 177606
177610                  UIPDR4= 177610
177612                  UIPDR5= 177612
177614                  UIPDR6= 177614
177616                  UIPDR7= 177616

                        ;*USER "D" PAGE DESCRIPTOR REGISTORS

177620                  UDPDR0= 177620
177622                  UDPDR1= 177622
177624                  UDPDR2= 177624
177626                  UDPDR3= 177626
177630                  UDPDR4= 177630
177632                  UDPDR5= 177632
177634                  UDPDR6= 177634
177636                  UDPDR7= 177636

                        ;*USER "I" PAGE ADDRESS REGISTERS

177640                  UIPAR0= 177640
177642                  UIPAR1= 177642
177644                  UIPAR2= 177644
177646                  UIPAR3= 177646
```

```
                        177650          UIPAR4= 177650
                        177652          UIPAR5= 177652
                        177654          UIPAR6= 177654
                        177656          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
```

```
                        SDPAR5= 172272
                        SDPAR6= 172274
                        SDPAR7= 172276

                        ;*KERNEL "I" PAGE DESCRIPTOR REGISTERS

                        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'
```

```

        170200                    MAPL00 = 170200
        170202                    MAPH00 = 170202
        170204                    MAPL01 = 170204
        170206                    MAPH01 = 170206
        170210                    MAPL02 = 170210
        170212                    MAPH02 = 170212
        170214                    MAPL03 = 170214
        170216                    MAPH03 = 170216
        170220                    MAPL04 = 170220
        170222                    MAPH04 = 170222
        170224                    MAPL05 = 170224
        170226                    MAPH05 = 170226
        170230                    MAPL06 = 170230
        170232                    MAPH06 = 170232
        170234                    MAPL07 = 170234
        170236                    MAPH07 = 170236
        170240                    MAPL10 = 170240
        170242                    MAPH10 = 170242
        170244                    MAPL11 = 170244
        170246                    MAPH11 = 170246
        170250                    MAPL12 = 170250
        170252                    MAPH12 = 170252
        170254                    MAPL13 = 170254
        170256                    MAPH13 = 170256
        170260                    MAPL14 = 170260
        170262                    MAPH14 = 170262
        170264                    MAPL15 = 170264
        170266                    MAPH15 = 170266
        170270                    MAPL16 = 170270
        170272                    MAPH16 = 170272
        170274                    MAPL17 = 170274
        170276                    MAPH17 = 170276
        170300                    MAPL20 = 170300
        170302                    MAPH20 = 170302
        170304                    MAPL21 = 170304
        170306                    MAPH21 = 170306
        170310                    MAPL22 = 170310
        170312                    MAPH22 = 170312
        170314                    MAPL23 = 170314
        170316                    MAPH23 = 170316
        170320                    MAPL24 = 170320
        170320                    MAPH24 = 170320
        170324                    MAPL25 = 170324
        170326                    MAPH25 = 170326
        170330                    MAPL26 = 170330
        170332                    MAPH26 = 170332
        170334                    MAPL27 = 170334
        170336                    MAPH27 = 170336
        170340                    MAPL30 = 170340
        170342                    MAPH30 = 170342
        170344                    MAPL31 = 170344
        170346                    MAPH31 = 170346
        170350                    MAPL32 = 170350
        170352                    MAPH32 = 170352
        170354                    MAPL33 = 170354
```

```
                        MAPH33 = 170356
                        MAPL34 = 170360
                        MAPH34 = 170362
                        MAPL35 = 170364
                        MAPH35 = 170366
                        MAPL36 = 170370
                        MAPH36 = 170372
                        MAPL37 = 170374
                        MAPH37 = 170376
                        .EQUIV  MAPL00,MAPL0
                        .EQUIV  MAPH00,MAPH0
                        .EQUIV  MAPL01,MAPL1
                        .EQUIV  MAPH01,MAPH1
                        .EQUIV  MAPL02,MAPL2
                        .EQUIV  MAPH02,MAPH2
                        .EQUIV  MAPL03,MAPL3
                        .EQUIV  MAPH03,MAPH3
                        .EQUIV  MAPL04,MAPL4
                        .EQUIV  MAPH04,MAPH4
                        .EQUIV  MAPL05,MAPL5
                        .EQUIV  MAPH05,MAPH5
                        .EQUIV  MAPL06,MAPL6
                        .EQUIV  MAPH06,MAPH6
                        .EQUIV  MAPL07,MAPL7
                        .EQUIV  MAPH07,MAPH7
170016                          UBCR2=170016


                        .SBTTL  IIST REGISTER DEFINITIONS


                        ;; IIST INTERNAL REGISTERS

000000                          PGTE = 0        ;;PROGRAM-GENERATED TRANSMISSION ENABLE
000001                          PGCS = 1        ;;PROGRAM-GENERATED CONTROL STATUS
000002                          STTE = 2        ;;SANITY-TIMER TRANSMISSION ENABLE
000003                          STCS = 3        ;;SANITY-TIMER CONTROL STATUS
000004                          IMSK = 4        ;;INPUT MASK
000005                          PGF = 5         ;;PROGRAM GENERATED FLAGS
000006                          STF = 6         ;;SANITY-TIMER FLAGS
000007                          DCF = 7         ;;DCLO/DISCONNECT FLAGS
000010                          EXC = 10        ;;EXCEPTIONS
000015                          MTC = 15        ;;MAINTAINANCE CONTROL


                        ;;IIST INTERRUPT VECTOR


                        .SBTTL  CONSOLE SWITCH SETTINGS
                                ;; WHEN THESE SWITCHES ARE ENABLED, IT SPECIFIES TO THE MASTER
                                ;; THAT THE CPU WITH THE IIST SELF ID CORRESPONDING TO THE
                                ;;EQUIVILENT BIT POSITION IS EXPECTED TO PARTICIPATE IN THIS TEST

000001                          CP0=BIT0                        ;CPU0 MASK LOCATION
000002                          CP1=BIT1                        ;CPU1 MASK LOCATION
000004                          CP2=BIT2                        ;CPU2 MASK LOCATION
```

```
                                CP3=BIT3                        ;CPU3 MASK LOCATION

                                ;; THE FOLLOWING SWITCHES CONTROL THE EXECUTION STREAM OF THE
                                ;; TEST.

000100                          MPSW= BIT6              ;ENABLE FOR MULTIPROCESSOR CONFIGURATIONS
000040                          UBESW= BIT5             ;ENABLE IF UNIBUS EXERCISER IS TO BE USED
001000                          LOE= BIT9               ;ENABLE FOR LOOPING ON ERRORS
040000                          LOT= BIT14              ;ENABLE FOR LOOPING ON TEST
100000                          HOE= BIT15              ;HALT ON ERROR


                        .SBTTL  RJP04 DEVICE REGISTERS
176700                          RPCS1=176700            ;;CONTROL AND STATUS 1
176702                          RPWC =176702            ;;WORD COUNT REGISTER
176704                          RPBA =176704            ;;UNIBUS ADDRESS
176706                          RPDA =176706            ;;DESIRED SECTOR/TRACK ADDRESS
176710                          RPCS2=176710            ;;CONTROL AND STATUS 2
176712                          RPDS =176712            ;;DRIVE STATUS
176714                          RPER1=176714            ;;ERROR REGISTER 1
176716                          RPAS =176716            ;;ATTENSION SUMMARY
176720                          RPLA =176720            ;;LOOK-AHEAD REGISTER
176722                          RPDB =176722            ;;DATA BUFFER REGISTER
176724                          RPMR =176724            ;;MAINTENANCE REGISTER
176726                          RPDT =176726            ;;DRIVE TYPE
176730                          RPSN =176730            ;;SERIAL NUMBER REGISTER
176732                          RPOF =176732            ;;OFFSET REGISTER
176734                          RPDC =176734            ;;DESIRED CYLINDER REGISTER
176736                          RPCC =176736            ;;CURRENT CYLINDER REGISTER
176740                          RPER2=176740            ;;ERROR REGISTER 2
176742                          RPER3=176742            ;;ERROR REGISTER 3
176744                          RPEC1=176744            ;;ECC POSITION REGISTER
176746                          RPEC2=176746            ;;ECC PATTERN REGISTER
```

```
                                .SBTTL  POWER FAIL FUNCTION TABLE BIT DIFINITIONS

            010000                      NCX=BIT12               ;;DON,T SAVE MM REGISTERS
            004000                      TI =BIT11               ;;TIME THE POWER FAIL
            002000                      NS =BIT10               ;;DON'T PERFORM A REGISTER SAVE
            001000                      SID=BIT9                ;;SEND ERROR ON ILLEGAL DOWN
            000400                      SIU=BIT8                ;;SEND ERROR ON ILLEGAL UP
            000200                      SED=BIT7                ;;SEND ERROR ON DOWN
            000100                      SEU=BIT6                ;;SED ERROR ON UP
            000040                      SSD=BIT5                ;;SEND SIGNAL ON DOWN
            000020                      SSU=BIT4                ;;SEND SIGNAL ON UP.
                                .SBTTL  TRAP CATCHER

            000000                      .=0
                                ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ''.+2,HALT''
                                ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
            000174              .=174
000174  000000                  DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
000176  000000                  SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
                                .SBTTL  ACT11 HOOKS

                                ;;**************************************************************
                                ;HOOKS REQUIRED BY ACT11
            000200                      $SVPC=.                 ;SAVE PC
            000046              .=46
000046  036112                  $ENDAD                          ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
            000052              .=52
000052  000000                  .WORD   0                       ;;2)SET LOC.52 TO ZERO
            000200              .=$SVPC                         ;; RESTORE PC


                                .SBTTL  LOAD START AND RESTART VECTORS
            000200              .=200
000200  000137  020064          JMP     STRT                    ;LOAD 200 WITH A JUMP TO START OF TEST
            000220              .=220
000220  004737  020000          JSR     PC,     RESTRT          ;LOAD 220 WITH A JUMP TO THE RESTART CODE
000224  000137  020064          JMP     STRT


                                .SBTTL  APT PARAMETER BLOCK

                                ;;**************************************************************
                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                ;;**************************************************************
            000230                      .$X=.   ;;SAVE CURRENT LOCATION
            000024              .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
000024  000200                  200     ;;FOR APT START UP
            000044              .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
000044  000230                  $APTHDR ;;POINT TO APT HEADER BLOCK
            000230              .=.$X   ;;RESET LOCATION COUNTER
```

```
                                ;;**********************************************************************
                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                ;INTERFACE SPEC.

000230                          $APTHD:
000230  000000                 $HIBTS: .WORD   0        ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
000232  014336                 $MBADR: .WORD   $MAIL    ;;ADDRESS OF APT MAILBOX (BITS 0-15)
000234  000000                 $TSTM:  .WORD            ;;RUN TIM OF LONGEST TEST
000236  000000                 $PASTM: .WORD            ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
000240  000000                 $UNITM: .WORD            ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
000242  000052                         .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                                .SBTTL  COMMON TAGS

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

                        014000          .=14000
014000                  014000  $CMTAG:                          ;;START OF COMMON TAGS
014000  000000                  .WORD   0
014002      000         014002  $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
014003      000                 .BYTE   0
014004      000                 .BYTE   0
014005      000                 .BYTE   0
014006      000         014006  $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
014007      000                 .BYTE   0
014010      000                 .BYTE   0
014011      000                 .BYTE   0
014012  000000          014012  $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
014014  000000                  .WORD   0
014016  000000                  .WORD   0
014020  000000                  .WORD   0
014022  000000          014022  $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
014024  000000                  .WORD   0
014026  000000                  .WORD   0
014030  000000                  .WORD   0
014032  000000          014032  $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
014034  000000                  .WORD   0
014036  000000                  .WORD   0
014040  000000                  .WORD   0
014042  000000          014042  $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
014044  000000                  .WORD   0
014046  000000                  .WORD   0
014050  000000                  .WORD   0
014052  000000                  .WORD   0
014054      000         014054  $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
014055      000                 .BYTE   0
014056      000                 .BYTE   0
014057      000                 .BYTE   0
014060      001         014060  $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
014061      001                 .BYTE   1
014062      001                 .BYTE   1
014063      001                 .BYTE   1
014064  000000          014064  $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
014066  000000                  .WORD   0
014070  000000                  .WORD   0
014072  000000                  .WORD   0
014074  000000          014074  $ERRSP: .WORD   0               ;;CONTAINS SP OF CPU IN ERROR
014076  000000                  .WORD   0
014100  000000                  .WORD   0
014102  000000                  .WORD   0
014104  000000          014104  $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
014106  000000                  .WORD   0
014110  000000                  .WORD   0
014112  000000                  .WORD   0
014114  000000          014114  $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
014116  000000                  .WORD   0
```

```
                                                .WORD   0
                                                .WORD   0
                                $GDDAT:         .WORD   0               ;;CONTAINS 'GOOD' DATA
                                                .WORD   0
                                                .WORD   0
                                                .WORD   0
                                $EOPSG:         .BYTE   0               ;;THIS TABLE HOLDS THE END OF PASS
                                                .BYTE   0
                                                .BYTE   0
                                                .BYTE   0

                                $BDDAT:         .WORD   0               ;;CONTAINS 'BAD' DATA
                                                .WORD   0
                                                .WORD   0
                                                .WORD   0
                                                .WORD   0               ;;RESERVED--NOT TO BE USED
                                                .WORD   0
                                $AUTOB:         .BYTE   0               ;;AUTOMATIC MODE INDICATOR
                                $INTAG:         .BYTE   0               ;;INTERRUPT MODE INDICATOR
                                                .WORD   0
                                SWR:            .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
                                                .WORD   DSWR
                                                .WORD   DSWR
                                                .WORD   DSWR
                                DISPLAY:        .WORD   DDISP           ;;ADDRESS OF DISPLAY REGISTER
                                                .WORD   DDISP
                                                .WORD   DDISP
                                                .WORD   DDISP
                                $$STP:          .WORD   STACK           ;;STACK INITIALIZATION FOR CPU0
                                                .WORD   STACK-2000      ;;  ''      ''              ''  CPU1
                                                .WORD   STACK-4000      ;;  ''      ''              ''  CPU2
                                                .WORD   STACK-10000     ;;  ''      ''              ''  CPU3
                                $TKS:           177560                  ;;TTY KBD STATUS
                                $TKB:           177562                  ;;TTY KBD BUFFER
                                $TPS:           177564                  ;;TTY PRINTER STATUS REG. ADDRESS
                                $TPB:           177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
                                $NULL:          .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
                                $FILLS:         .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
                                $FILLC:         .BYTE   12              ;;INSERT FILL CHARS. AFTER A 'LINE FEED'
                                $TPFLG:         .BYTE   0               ;;'TERMINAL AVAILABLE' FLAG (BIT<07>=0=YES)
                                $ERGBL:         .WORD   0
                                $CPUID:         .WORD   -1              ;;THIS TABLE HOLDS THE PHYSICAL ID OF
                                                .WORD   -1              ;;THE PARTICIPATING PROCESSORS ARRANGED
                                                .WORD   -1              ;;IN LOGICAL ORDER.
                                                .WORD   -1
                                $REGAD:         .WORD   0       ;;CONTAINS THE ADDRESS FROM
                                                                ;;WHICH  ($REG0) WAS OBTAINED
                                $REG0:          .WORD   0,0,0,0         ;;CONTAINS (($REGAD)+0+6)

                                $REG1:          .WORD   0,0,0,0         ;;CONTAINS (($REGAD)+2+6)

                                $REG2:          .WORD   0,0,0,0         ;;CONTAINS (($REGAD)+4+6)

                                $REG3:          .WORD   0,0,0,0         ;;CONTAINS (($REGAD)+6+6)

                                $REG4:          .WORD   0,0,0,0         ;;CONTAINS (($REGAD)+10+6)
```

```
000000
000000
000000
000000
000000
000000
000000
000000
000000
000000
000000
000077
000015
000012
                        ;;*****************************************************************
                        .SBTTL  APT MAILBOX-ETABLE

                        ;;*****************************************************************
                        .EVEN
014336                  $MAIL:                          ;;APT MAILBOX
000000                  $MSGTY: .WORD   AMSGTY          ;;MESSAGE TYPE CODE
000000                  $FATAL: .WORD   AFATAL          ;;FATAL ERROR NUMBER
000000                  $TESTN: .WORD   ATESTN          ;;TEST NUMBER
000000                  $PASS:  .WORD   APASS           ;;PASS COUNT
000000                  $DEVCT: .WORD   ADEVCT          ;;DEVICE COUNT
000000                  $UNIT:  .WORD   AUNIT           ;;I/O UNIT NUMBER
000000                  $MSGAD: .WORD   AMSGAD          ;;MESSAGE ADDRESS
000000                  $MSGLG: .WORD   AMSGLG          ;;MESSAGE LENGTH
014356                  $ETABLE:                        ;;APT ENVIRONMENT TABLE
000                     $ENV:   .BYTE   AENV            ;;ENVIRONMENT BYTE
000                     $ENVM:  .BYTE   AENVM           ;;ENVIRONMENT MODE BITS
000000                  $SWREG: .WORD   ASWREG          ;;APT SWITCH REGISTER
000000                  $USWR:  .WORD   AUSWR           ;;USER SWITCHES
000000                  $CPUOP: .WORD   ACPUOP          ;;CPU TYPE,OPTIONS
                        ;*                              BITS 15-11=CPU TYPE
                        ;*                                      11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                        ;*                                      11/70=06,PDQ=07,Q=10
                        ;*                              BIT 10=REAL TIME CLOCK
                        ;*                              BIT  9=FLOATING POINT PROCESSOR
                        ;*                              BIT  8=MEMORY MANAGEMENT
000                     $MAMS1: .BYTE   AMAMS1          ;;HIGH ADDRESS,M.S. BYTE
000                     $MTYP1: .BYTE   AMTYP1          ;;MEM. TYPE,BLK#1
                        ;*                              MEM.TYPE BYTE   --  (HIGH BYTE)
                        ;*                                      900 NSEC CORE=001
                        ;*                                      300 NSEC BIPOLAR=002
                        ;*                                      500 NSEC MOS=003
000000                  $MADR1: .WORD   AMADR1          ;;HIGH ADDRESS,BLK#1
                        ;*                                MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF 'TYPE" ABOVE
000                     $MAMS2: .BYTE   AMAMS2          ;;HIGH ADDRESS,M.S. BYTE
000                     $MTYP2: .BYTE   AMTYP2          ;;MEM.TYPE,BLK#2
000000                  $MADR2: .WORD   AMADR2          ;;MEM.LAST ADDRESS,BLK#2
000                     $MAMS3: .BYTE   AMAMS3          ;;HIGH ADDRESS,M.S.BYTE
000                     $MTYP3: .BYTE   AMTYP3          ;;MEM.TYPE,BLK#3
000000                  $MADR3: .WORD   AMADR3          ;;MEM.LAST ADDRESS,BLK#3
000                     $MAMS4: .BYTE   AMAMS4          ;;HIGH ADDRESS,M.S.BYTE
000                     $MTYP4: .BYTE   AMTYP4          ;;MEM.TYPE,BLK#4
000000                  $MADR4: .WORD   AMADR4          ;;MEM.LAST ADDRESS,BLK#4
```

```
                                        $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
                                        $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
                                        $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
                                        $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
                                        $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
                                        $CDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
                                        $DDW0:  .WORD   ADDW0   ;;DEVICE DESCRIPTOR WORD#0
                                        $DDW1:  .WORD   ADDW1   ;;DEVICE DESCRIPTOR WORD#1
                                        $DDW2:  .WORD   ADDW2   ;;DEVICE DESCRIPTOR WORD#2
                                        $DDW3:  .WORD   ADDW3   ;;DEVICE DESCRIPTOR WORD#3
                                        $DDW4:  .WORD   ADDW4   ;;DEVICE DESCRIPTOR WORD#4
                                        $DDW5:  .WORD   ADDW5   ;;DEVICE DESCRIPTOR WORD#5
                                        $DDW6:  .WORD   ADDW6   ;;DEVICE DESCRIPTOR WORD#6
                                        $DDW7:  .WORD   ADDW7   ;;DEVICE DESCRIPTOR WORD#7
                                        $DDW8:  .WORD   ADDW8   ;;DEVICE DESCRIPTOR WORD#8
                                        $DDW9:  .WORD   ADDW9   ;;DEVICE DESCRIPTOR WORD#9
                                        $DDW10: .WORD   ADDW10  ;;DEVICE DESCRIPTOR WORD#10
                                        $DDW11: .WORD   ADDW11  ;;DEVICE DESCRIPTOR WORD#11
                                        $DDW12: .WORD   ADDW12  ;;DEVICE DESCRIPTOR WORD#12
                                        $DDW13: .WORD   ADDW13  ;;DEVICE DESCRIPTOR WORD#13
                                        $DDW14: .WORD   ADDW14  ;;DEVICE DESCRIPTOR WORD#14
                                        $DDW15: .WORD   ADDW15  ;;DEVICE DESCRIPTOR WORD#15

                                        $ETEND:

                                        STOP:   0,0,0,0,0,0,0,0         ;MEM BOX UPPER BOUND ADDRESS TABLE

                                        START:  0,0,0,0,0,0,0,0         ;MEM BOX  STARTING ADDRESS TABLE

                                        PWRFL:  0                       ;=0 DON'T EXPECT CPU POWER FAIL,=1 EXPECT IT
                                        YYY:    0                       ;ERROR ROUTINE WORK LOC
                                        BOOT:   0                       ;=0 DON'T EXPECT CPU BOOT, =1 EXPECT IT
                                        PATCHK: 0                       ;=0 WRITE AND CHECK MEM PATTERN,=1 CHECK ONLY
                                        HICORE: 0                       ;=1 TURN ON MM ON POWER-UP
                                        RELOUP: 0                       ;=0 DON'T RELOCATE,=1 RELOCATE
                                        RELODN: 0                       ;=0 DON'T RELOCATE,=1 RELOCATE
                                        EXIT:   0                       ;=0 DON'T EXIT, =1 EXIT TEST
                                        ENTR22: 0                       ;CONTROL ENTRY INTO TEST 22
                                        ENTR23: 0                       ;CONTROL ENTRY INTO TEST 23
                                        ENTR24: 0                       ;CONTROL ENTRY INTO TEST 24
                                        HIBOX:  0                       ;RELOCATE TO THIS MEM BOX
                                        SAVRG:  0,0,0,0                 ;A PLACE TO SAVE A REGISTER

                                        ROUTE:  0,0,0,0                 ;TYPE TRAP ROUTE TABLE


                                        SAV6:   0,0,0,0                 ;SOME PLACE TO PUT THE SP

                                        FLAG:   0,0,0,0                 ;INSTRUCTION DOWN FLAG

                                        PFFT:   .WORD   0,0,0,0         ;;POWER FAIL FUNCTION TABLE

                                        PFDT:   .WORD   0,0,0,0         ;;POWER FAIL DURATION TABLE
```

```
 830  014630  000000
 831  014632  000000  000000  000000  MBDSW:  .WORD   0,0,0,0          ;;MASSBUS DEVICE SELECTION WORD
 832  014640  000000
 833  014642  000000                  SIGNAL: 0                       ;POWER ROUTINE SIGNAL
 834  014644  000000                  SLVID:  .WORD   0               ;;THIS WORD HOLDS ACTUAL LOG. ID.
 835  014646  000000                  BOXNUM: .WORD   0               ;NUMBER OF BOXES OF MK11 MEMORY
 836  014650  000000  000000  000000  CKSUM:  .WORD   0,0,0,0          ;CHECKSUM  TABLE
 837  014656  000000
 838  014660  000000                  $PSWR:  .WORD   0               ;PSEUDOSWITCH REGISTER
 839  014662  000000  000000  000000  PWRTAB: .WORD   0,0,0,0          ;POWERFAIL DISPATCH TABLE
 840  014670  000000
 841  014672  000000  000000  000000  ISTTAB: .WORD   0,0,0,0          ;IIST DISPATCH TABLE
 842  014700  000000
 843  014702  000000  000000  000000  ERRTAB: .WORD   0,0,0,0          ;CPU ERROR VECTOR DISPATCH TABLE
 844  014710  000000
 845  014712  000000                  SYNC.1: .WORD   0               ;SEMAPHORE
 846  014714  000000                  SYNC.2: .WORD   0               ;SEMAPHORE
 847  014716  001000                  TYPQUE: .BLKW   1000            ;MESSAGE POINTER AREA
 848  016716  000000                  S2LOG1: .WORD   0               ;LOG-IN LOCK
 849  016720  000000                  S2LOG2: .WORD   0               ;LOG-OUT LOCK
 850  016722  000000                  C1:     .WORD   0               ;;A-FORK CONTROL VARIABLES
 851  016724  000000                  C2:     .WORD   0
 852  016726  000000                  D1:     .WORD   0
 853  016730  000000                  D2:     .WORD   0
 854  016732  000000                  E1:     0
 855  016734  000000                  E2:     0
 856  016736     000                  FLAGB:  .BYTE   0
 857  016737     000                  MPF:    .BYTE   0               ;MULTIPROCESSOR FLAG
 858  016740  000000                  UBEF:   .WORD   0               ;UBE FLAB
 859  016742  000000  000000  000000  RPPGM:  .WORD   0,0,0,0          ;SHARED RP04 DRIVE TABLE
 860  016750  000000
 861  016752  000000                  LOOPS:  .WORD   0               ;# OF LOOPS REQUIRED ON POWER DOWN
 862  016754  000000                  COUNT0: 0                       ;TIME CPU POWER-DOWN
 863  016756  000000                  COUNT1: 0
 864  016760  000000                  COUNT2: 0
 865  016762  000000                  COUNT3: 0
 866  016764  000000                  LOG1:   .WORD   0               ;ENTRY CONTROL LOGS
 867  016766  000000                  LOG2:   .WORD   0
 868  016770  000000                  CPULS1: .WORD   0               ;NUMBER OF ACTIVE SLAVE CPU'S
 869  016772  000000                  EXTRA:  0                       ;EST. INITIAL PART OF PWR DWN TIME
 870  016774  000001                  CPUACT: 1                       ;CPUS UNDER TEST
 871  016776  000001                  SYNC.3: 1                       ;SEMAPHORE
 872  017000  000001                  INTMSK: 1                       ;IIST INTERRUPT ENABLE BIT
 873  017002  000001                  ERRLCK: 1                       ;ERROR ROUTINE SEMAPHORE
 874  017004  000001                  C3:     1                       ;A-FORK CONTROL VARIABLES
 875  017006  000001                  D3:     1
 876  017010  000001                  E3:     1
 877  017012  000001  000001  000001  NOPRMP: 1,1,1,1                  ;=1 DON'T TYPE CPU IDENTIFICATION
 878  017020  000001
 879  017022  000001                  UBELCK: 1                       ;UBE SEMAPHORE
 880  017024  000001                  TQL1:   1                       ;TYPE SEMAPHORE
 881  017026  000001                  S2L1:   .WORD   1               ;INITIALIZATION SEMAPHORE
 882  017030  177500                  ACR:    177500                  ;IIST ACCESS CONTROL REGISTER
 883  017032  177502                  ADR:    177502                  ;IIST ACCESS DATA REGISTER
 884  017034  000260                  ISTVEC: 260                     ;IIST INTERRUPT VECTOR
 885  017036  177777                  FIRST:  .WORD   -1              ;INCREMENTED BY EACH PROCESSOR
```

```
886  017040  000400                  BMSK:   .WORD   400                     ;;IIST INITIAL BOOT MASK
887  017042  051266  061266  071266  BFADR:  .WORD   DSKBUF,DSKBUF+10000,DSKBUF+20000,DSKBUF+30000   ;MASSBUS TRANSFER BUF AR
888  017050  101266
889  017052  000400  000400  000400  YELLIM: .WORD   400,400,400,400                                   ;YELLOW ZONE BOUNDARY
890  017060  000400
891  017062  177777                  PUT:    -1                              ;CPU UNDER TEST
892  017064  177777                  TYPLCK: -1                              ;ERROR/TYPE SEMAPHORE
893  017066  006405                  FACTOR: 20000./6                        ;POWER DWN FACTER
894                                          .EVEN
```

```
                                .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

017070                          $ERRTB:
                                        ;;ITEM  1
017070  045274                          EM1             ;UNEXPECTED POWER FAILURE ON CPU
017072  046563                          DH10            ;TESTNO  ERRORPC
017074  047166                          DT10            ;$TSTNM,$ERRPC
017076  000000                          0

                                        ;;ITEM  2
017100  045336                          EM2             ;UNEXPECTED POWER UP SEQUENCE ON CPU
017102  000000                          0
017104  000000                          0
017106  000000                          0

                                        ;;ITEM  3
017110  045404                          EM3             ;ILLEGAL POWER DOWN SEQUENCE
017112  000000                          0
017114  000000                          0
017116  000000                          0

                                        ;;ITEM  4
017120  045451                          EM4             ;ILLEGAL POWER UP SEQUENCE
017122  000000                          0
017124  000000                          0
017126  000000                          0

                                        ;;ITEM  5
017130  045505                          EM5             ;UNEXPECTED TRAP TO LOCATION 4
017132  046461                          DH5             ;PID   ERRORPC   CPUERR
017134  047144                          DT5             ;$REG0,$ERRPC,$REG1
017136  000000                          0

                                        ;;ITEM  6
017140  045534                          EM6             ;UNEXPECTED TRAP TO 10
017142  046461                          DH5             ;PID   ERRORPC   CPUERR
017144  047144                          DT5
017146  000000                          0

                                        ;;ITEM  7
017150  045564                          EM7             ;UNEXPECTED TRAP TO 114
017152  046514                          DH7             ;PID   ERRORPC   CPUERR   MEMERR
017154  047154                          DT7             ;$REG0,$ERRPC,$REG1,$REG2
017156  000000                          0
```

```
                                        ;;ITEM  10
017160  045615                          EM10            ;ADDRESS ON THE STACK IS WRONG
017162  046563                          DH10            ;TESTNO   ERRORPC
017164  047166                          DT10            ;$TSTNM,ERRORPC
017166  000000                          0

                                        ;;ITEM  11
017170  045651                          EM11            ;OLD PS IS WRONG
017172  046606                          DH11            ;TESTNO   ERRORPC    PS
017174  047174                          DT11            ;$TSTNM,$ERRPC,$REG0
017176  000000                          0

                                        ;;ITEM  12
017200  045673                          EM12            ;ODD ADDRESS TRAP FAILED
017202  046563                          DH10
017204  047166                          DT10
017206  000000                          0

                                        ;;ITEM  13
017210  045725                          EM13            ;MEMORY CORRUPTED ON POWER FAIL
017212  046640                          DH12
017214  047204                          DT12
017216  000000                          0

                                        ;;ITEM  14
017220  045766                          EM14            ;TIMEOUT TRAP FAILED
017222  046727                          DH14            ;TESTNO   ERRORPC    CPUERR
017224  047174                          DT11            ;$TSTNM,$ERRPC,$REG0
017226  000000                          0

                                        ;;ITEM  15
017230  046014                          EM15            ;POWER FAIL RETURNED TO SOON
017232  046563                          DH10
017234  047166                          DT10
017236  000000                          0

                                        ;;ITEM  16
017240  046053                          EM16            ;NOT ENOUGH OR TOO MABY INSTRUCTIONS EXECUTED
017242  046563                          DH10
017244  047166                          DT10
017246  000000                          0

                                        ;;ITEM  17
017250  046132                          EM17            ;NO MEM. MANG. VIOLATION OR TRAP TO 4
017252  046727                          DH14
017254  047174                          DT11
017256  000000                          0

                                        ;;ITEM  20
017260  046201                          EM20            ;NO IIST INTERRUPT
017262  046762                          DH20            ;TESTNO   ISTID   ACR   PGTE   PGCS
017264  047214                          DT20            ;$TSTNM,$REG0,$REG1,$REG2,$REG3
017266  000000                          0

                                        ;;ITEM  21
```

```
1007  017270  046225                          EM21            ;INCORRECT BRK AND/OR DCF FLAGS
1008  017272  047037                          DH21            ;TESTNO   ISTID   FOUND    SHOULD BE
1009  017274  047230                          DT21            ;$TSTNM,$REG0,$REG1,$REG2
1010  017276  000000                          0
1011
1012                                          ;;ITEM  22
1013  017300  046266                          EM22            ;CPU DID NOT TRAP TO 24
1014  017302  047107                          DH22            ;TESTNO  ISTID   ERRORPC
1015  017304  047242                          DT22            ;$TSTNM,$REG0,$ERRPC
1016  017306  000000                          0
1017
1018                                          ;;ITEM  23
1019  017310  046327                          EM23            ;CHECKSUM ON MASSBUS TRANSFER IS WRONG
1020  017312  047107                          DH22
1021  017314  047242                          DT22
1022  017316  000000                          0
1023
1024                                          ;;ITEM  24
1025  017320  046377                          EM24            ;NO POWER FAIL ON CPU
1026  017322  046563                          DH10            ;TESTNO ERRORPC
1027  017324  047166                          DT10            ;$TSTNM,$ERRPC
1028  017326  000000                          0
1029
1030                                          ;;ITEM  25
1031  017330  046426                          EM25            ;UNEXPECTED CPU INTERRUPT
1032  017332  046563                          DH10            ;TESTNO ERRORPC
1033  017334  047166                          DT10            ;$TSTNM,$ERRPC
1034  017336  000000                          0
1035
1036
1037
1038
1039
1040
1041          020000                          .=20000                 ;;LOAD CODE ABOVE THE FIRST 4K (WORDS)
1042  020000                          RESTRT:
1043  020000  012704  016774                  MOV     #CPUACT,        R4      ;RESET THE VARIABLES
1044  020004  012724  000001          1$:     MOV     #1,     (R4)+
1045  020010  022704  017026                  CMP     #S2L1,  R4
1046  020014  103373                          BHIS    1$
1047  020016  012704  014462                  MOV     #STOP,  R4
1048  020022  005024                  2$:     CLR     (R4)+
1049  020024  022704  016772                  CMP     #EXTRA, R4
1050  020030  103374                          BHIS    2$
1051  020032  012737  177777  017036          MOV     #-1,    FIRST
1052  020040  012737  000400  017040          MOV     #400,   BMSK
1053  020046  012737  177777  017062          MOV     #-1,    PUT
1054  020054  012737  177777  017064          MOV     #-1,    TYPLCK
1055  020062  000207                          RT      PC                      ;RETURN
1056
1057  020064  013706  014200          STRT:   MOV     $$STP,  SP      ;INITIALIZE THE STACK
1058  020070  012704  014226                  MOV     #$CPUID,R4              ;;GET ADDRESS OF CPUID TABLE
1059  020074  012703  000004                  MOV     #4,R3                   ;;INIT COUNTER
1060  020100  012724  177777          4$:     MOV     #-1,(R4)+               ;;INIT TABLE WITH -1'S
1061  020104  077303                          SOB     R3,4$
1062                                          ;;INITIALIZE A FEW VECTORS
```

```
1063  020106  012737  036432  000030          MOV     #$ERROR,@#EMTVEC        ;;EMT VECTOR FOR ERROR ROUTINE
1064  020114  005037  000032                  CLR     @#EMTVEC+2              ;;LEVEL 0
1065  020120  012737  040520  000034          MOV     #$TRAP,@#TRAPVEC        ;;TRAP VECTOR FOR TRAP CALLS
1066  020126  005037  000036                  CLR     @#TRAPVEC+2             ;;LEVEL 0
1067  020132  012737  040606  000024          MOV     #PWRDIS,@#PWRVEC        ;;POINT TO POWER FAIL DISPATCH ROUTINE
1068  020140  005037  000026                  CLR     @#PWRVEC+2              ;;LEVEL 0
1069  020144  012737  020330  000004          MOV     #25$,@#ERRVEC           ;;SET UP CPU ERROR VECTOR INCASE SWR IS'NT THERE
1070  020152  012737  014722  014716          MOV     #TYPQUE+4,TYPQUE        ;;INITIALIZE REAR POINTER
1071  020160  012737  014722  014720          MOV     #TYPQUE+4,TYPQUE+2      ;;INITIALIZE FORWARD POINTER
1072  020166  005000                          CLR     R0                      ;;SET ID IN DISPLACEMENT REGS.
1073  020170  005001                          CLR     R1
1074  020172  023737  000042  000046          CMP     @#42,   @#46            ;UNDER ACT AUTO MODE?
1075  020200  001402                          BEQ     40$                     ;BRANCH IF YES
1076  020202  104401  040644                  TYPE    ,TM1                    ;TYPE PROGRAM NAME
1077  020206                          40$:
1078  020206  012737  177570  014160          MOV     #177570,        SWR     ;;SET SWR
1079  020214  132737  000200  014357          BITB    #APTSIZE,       $ENVM           ;;SIZE UNDER APT?
1080  020222  001403                          BEQ     50$                     ;;BRANCH IF NO
1081  020224  012737  014360  014160          MOV     #$SWREG,        SWR     ;;USE APT SWITCH REG
1082  020232  032777  000100  173720  50$:    BIT     #MPSW,@SWR              ;;IS HARDWARE SWITCH REG. THERE? AND MP SET?
1083  020240  001021                          BNE     20$                     ;;SWR IS THERE AND MP IS SET.
1084  020242  001435                          BEQ     30$                     ;;SWR IS THERE BUT MP IS NOT SET.
1085  020244  012737  040624  000004          MOV     #ERRDIS,@#ERRVEC        ;;RESET CPU ERROR VECTOR
1086  020252  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;;FLAG ALL UNEXPECTED TRAPS TO 4
1087  020260  012737  014360  014160          MOV     #$SWREG,SWR             ;;SETUP FOR SOFTWARE SWITCH REG
1088  020266  012737  000174  014170          MOV     #DISPREG,DISPLAY
1089  020274  032777  000100  173656          BIT     #MPSW,@SWR              ;;IS MP SWITCH SET IN SOFTWARE SWITCH REG?
1090  020302  001415                          BEQ     30$                     ;;NOPE.
1091  020304  012737  040624  000004  20$:     MOV     #ERRDIS,@#ERRVEC        ;;RESET ERROR VECTOR
1092  020312  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;;FLAG ALL UNEXPECTED TRAPS TO 4
1093  020320  152737  000001  016737          BISB    #BIT0,MPF               ;;SET THE MP FLAG.
1094  020326  000416                          BR      31$                     ;;LET'S GO
1095  020330  062716  000004          25$:     ADD     #4,(SP)                 ;;SKIP RETURN
1096  020334  000002                          RTI                             ;;RETURN FROM TRAP
1097  020336  012737  040624  000004  30$:     MOV     #ERRDIS,@#ERRVEC        ;;RESET ERROR VECTOR
1098  020344  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;;FLAG ALL UNEXPECTED TRAPS TO 4
1099  020352  105037  016737                  CLRB    MPF             ;;CLEAR THE MP FLAG
1100  020356  104401  041100                  TYPE    ,TM7            ;;[UNIPROCESSOR MODE IS IN EFFECT]
1101  020362  000425                          BR      42$             ;;ENTER INTO NON MP EXECUTION STREAM
1102  020364  104401  041033          31$:     TYPE    ,TM6            ;;[MULTIPROCESSOR MODE IS IN EFFECT]
1103  020370  017737  173564  014660          MOV     @SWR,$PSWR      ;;SET UP PSEUDO SWITCH REGISTER.
1104  020376  012704  014160                  MOV     #SWR,R4 ;;POINT TO SWR TABLE
1105  020402  012705  000004                  MOV     #4,R5           ;;SET COUNTER
1106  020406  012724  014660          41$:     MOV     #$PSWR,(R4)+    ;;LOAD THE SLAVE SWITCH REG. POINTERS
1107  020412  077503                          SOB     R5,41$          ;;LOOP TILL DONE
1108  020414  104401  040676                  TYPE    ,TM2            ;;'SWITCH REGISTER = ''
1109  020420  017746  173534                  MOV     @SWR,-(SP)      ;;SAVE @SWR FOR TYPEOUT
1110  020424  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
1111  020426  104401  014333                  TYPE    ,$CRLF          ;;TYPE CRLF
1112  020432  104401  014333                  TYPE    ,$CRLF
1113  020436  032777  000040  173514  42$:     BIT     #UBESW,@SWR     ;;UBE SWITCH SET?
1114  020444  001411                          BEQ     43$             ;;NOT USED
1115  020446  032777  000200  173504          BIT     #SW07,  @SWR    ;;WILL SECTION 1 BE SKIPPED?
1116  020454  001005                          BNE     43$             ;;BRANCH IF YES
1117  020456  104401  040723                  TYPE    ,TM4            ;;''[UNIBUS EXERCISER WILL BE USED]''
1118  020462  105237  016740                  INCB    UBEF            ;;SET UBE FLAG
```

```
1119  020466  000404                          BR      65$
1120  020470  104401  040765          43$:    TYPE    ,TM5            ;;''[UNIBUS EXERCISER WILL NOT BE USED]''
1121  020474  105037  016740                  CLRB    UBEF            ;;CLEAR THE UBE FLAG
1122  020500  105737  016737          65$:    TSTB    MPF             ;;MULTIPROCESSOR MODE IN EFFECT?
1123  020504  001002                          BNE     55$             ;;BRANCH IF YES
1124  020506  000137  021076                  JMP     ST0             ;;START SETTING UP VECTORS
1125                                  .SBTTL  BOOT AND INITIALIZE THE SLAVE CPUS
1126  020512  017702  173442          55$:    MOV     @SWR,R2         ;;COPY SWITCH REGISTER INTO R2
1127  020516  012737  000001  016774          MOV     #1,CPUACT       ;;RESET # OF ACTIVE CPUS
1128  020524  052777  100000  176276          BIS     #BIT15,@ACR     ;;INITIALIZE THE IIST.
1129  020532  012705  002000                  MOV     #2000,R5        ;;LET IT SETTLE AFTER INIT
1130  020536  077501                          SOB     R5,.
1131  020540  012777  000001  176262  81$:    MOV     #1,@ACR         ;;ACCESS PGCS REGISTER
1132  020546  032777  004000  176256          BIT     #BIT11,@ADR     ;;IS IT READY
1133  020554  001771                          BEQ     81$             ;;NOT YET.
1134  020556  017705  176246                  MOV     @ACR,R5         ;;COPY ACR TO R5
1135  020562  072527  177770                  ASH     #-10,R5         ;;CREAT PHYSICAL ID
1136  020566  104401  041665                  TYPE    ,TM76           ;;IDENTIFY THE MASTER
1137  020572  010546                          MOV     R5,     -(SP)
1138  020574  104405                          TYPDS
1139  020576  010537  014226                  MOV     R5,$CPUID       ;;SET SELF ID OF MASTER IN TABLE
1140  020602  005000                          CLR     R0              ;;REG0. CONTAINS WORD DISPLACE-
1141                                                                  ;;MENT INTO CPUID TABLE ***
1142  020604  005001                          CLR     R1              ;;R1 CONTAINS THE BYTE DISPLACEMENT,...
1143                                                                  ;;THE TRUE LOGICAL ID.
1144  020606  012777  000007  176214          MOV     #DCF,@ACR       ;;ACCESS DCF REGISTER OF IIST
1145  020614  017703  176212                  MOV     @ADR,R3 ;;COPY DCF INTO R3
1146  020620  072327  177770                  ASH     #-10,R3         ;;BRING BRK MASK INTO POSITION
1147  020624  012777  021140  176202          MOV     #SLVENT,@ISTVEC ;;SET ENTRY POINT FOR SLAVES
1148
1149  020632  005004                          CLR     R4              ;;R4 CONTAINS THE DECIMAL VALUE
1150                                                                  ;;OF THE SELF ID OF THE CPU UNDER
1151                                                                  ;;INTEROGATION.
1152  020634  032702  000001          1$:     BIT     #BIT0,R2        ;;DO WE WANT THIS CPU?
1153  020640  001471                          BEQ     2$              ;;NO,CONTINUE
1154  020642  032703  000001                  BIT     #BIT0,R3        ;;IS IT ALIVE?
1155  020646  001413                          BEQ     82$             ;;YES
1156  020650  010437  014310                  MOV     R4,$TMP0        ;;SAVE CONTENTS OF R4
1157  020654  104401  014333                  TYPE    ,$CRLF          ;;NO,CRLF
1158  020660  104401  041176                  TYPE    ,TM11           ;;''CPU # ''
1159  020664  013746  014310                  MOV     $TMP0,-(SP)     ;;SAVE $TMP0 FOR TYPEOUT
1160  020670  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
1161  020672  104401  041207                  TYPE    ,TM12           ;;''SPECIFIED BUT NOT ACTIVE''
1162  020676  020437  014226          82$:    CMP     R4,$CPUID       ;;IS THIS THE MASTER?
1163  020702  001450                          BEQ     2$              ;;YES, IGNORE
1164  020704  012737  020000  000000          MOV     #20000, @#0     ;M9312MP MOVES @#0 TO SP ON BOOT
1165  020712  012777  000000  176110          MOV     #PGTE,@ACR      ;;ACCESS PGTE REG.
1166  020720  013777  017040  176104          MOV     BMSK,@ADR       ;;SET TO BOOT AND THEN...
1167  020726  052777  000001  176076          BIS     #BIT0,@ADR      ;;BOOT THE CPU
1168  020734  012701  000200                  MOV     #200,   R1      ;;SET UP A LONG DELAY (5 SEC)
1169  020740  077001                  70$:    SOB     R0,     .
1170  020742  077102                          SOB     R1,     70$
1171  020744  012777  000001  176056  83$:    MOV     #PGCS,  @ACR    ;CHECK FOR IIST READY
1172  020752  032777  004000  176052          BIT     #BIT11, @ADR
1173  020760  001771                          BEQ     83$             ;BRANCH IF NOT
1174  020762  005077  176042          84$:    CLR     @ACR            ;;RESET ACR (POINT TO PGTE)
```

```
                                                MOV     INTMSK,@ADR     ;;SET UP TO INTERRUPT
                                                BIS     #BIT0,@ADR      ;;GO!,INTERRUPT SLAVE
                                                INC     CPUACT          ;COUNT ANOTHER ACTIVE CPU
                                        85$:    MOV     #PGCS,@ACR      ;;CHECK FOR IIST READY
                                                BIT     #BIT11,@ADR
                                                BEQ     85$
                                        2$:     CMP     R4,#3           ;;ALL CPUS STARTED?
                                                BGE     3$              ;;YES
                                                INC     R4              ;;NEXT CPU TO ATTEMPT TO BOOT
                                                ASR     R2              ;;NEXT SWITCH REG. BIT
                                                ASR     R3              ;;NEXT BRK BIT TO SET
                                                ASL     BMSK            ;;NEXT BOOT MASK
                                                ASL     INTMSK          ;;NEXT INTERRUPT MASK
                                                BR      1$              ;;GO TRY ANOTHER
                                        3$:     BIS     #BIT9,  CONTRL  ;SET CACHE BYPASS
                                                CLR     @#0             ;RESTORE LOC. 0
                                                MOV     CPUACT,CPULS1
                                                DEC     CPULS1          ;CONTAINS # OF ACTIVE SLAVE CPU'S


                                .SBTTL  INITIALIZE THE COMMON TAGS


                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
                                STO:    BIS     #14,    CONTRL  ;DISABLE CACHE
                                        MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
                                        CLR     (R6)+           ;;CLEAR MEMORY LOCATION
                                        CMP     #SWR,R6 ;;DONE?
                                        BNE     .-6             ;;LOOP BACK IF NO
                                        MOV     $$STP,SP        ;;SETUP THE STACK POINTER
                                        MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
                                        CLR     $PASS           ;;CLEAR PASS COUNT
                                        BR MSTENT
                                SLVENT:
                                        BIS     #BIT9,@#CONTRL  ;;TURN OFF CACHE
                                        INC     SLVID           ;;CREATE CPUID
                                        MOV     SLVID,R1        ;;AND MOV TO R1
                                        MOV     R1,R0
                                        ASL     R0              ;;CREATE WORD INDEX INTO CPU TABLE
                                        MOV     @ACR,   R5      ;;COPY ACR
                                        ASH     #-10,   R5      ;;GET THE ID
                                        MOV     R5,$CPUID(R0)   ;;SET SELF-ID INTO TABLE
                                        BIS     #BIT15,@ACR     ;;RESET THE IIST
                                        MOV     #PGCS,  @ACR    ;ENABLE INTERRUPTS
                                        BIS     #BIT2,  @ADR
                                        CLR     @#PSW           ;;LOWER PROCESSOR PRIORITY
                                MSTENT:
                                        CLR     $ESCAPE(R0)             ;;CLEAR THE ESCAPE(R0) ON ERROR ADDRESS
                                        MOV     10$(R0),$LPERR(R0)      ;;SETUP FOR THE ERROR LOOP ADDRESS
                                        JMP     @FORKTB(R0)             ;;DISPATCH THE FOLLOWERS
                                10$:    TST1
                                        TST1
```

```
                                        TST1
                                        TST1
                            FORKTB:     MS0
                                        SL1
                                        SL2
                                        SL3
021246  021450                  SL1:    MOV     $$STP(R0),SP    ;;INITIALIZE SLAVE STACK (CPU1)
021250  021450                          WAIT                    ;;WAIT FOR MASTER TO START VIA INTERRUPT
021252  021342  014200          175532  BIS     #BIT15,@ACR     ;;RESET THE IIST
021254  021262                          JMP     TST1
021256  021302                  SL2:    MOV     $$STP(R0),SP    ;;INITIALIZE SLAVE STACK (CPU2)
021260  021322                          WAIT                    ;;WAIT FOR MASTER TO INTERRUPT
021262  016006  014200          175512  BIS     #BIT15,@ACR     ;;RESET THE IIST
021266  000001                          JMP     TST1
021270  052777  100000          175532  SL3:    MOV     $$STP(R0),SP    ;;INITIALIZE SLAVE STACK (CPU3)
021276  000137  021450                  WAIT                    ;;WAIT FOR MASTER TO INTERRUPT
021302  016006  014200          175512  BIS     #BIT15,@ACR     ;;RESET THE IIST
021306  000001                          JMP     TST1
021310  052777  100000          175472  MS0:    TSTB    MPF             ;;MP MODE?
021316  000137  021450                  BEQ     BEGIN           ;;NO,DON'T TRY TO INTERRUPT CPUS
021322  105737  016737          017034  MOV     ISTVEC, R2      ;SET UP RETURN FROM INTERRUPT
021326  001440                  000002  ADD     #2,     R2
021330  013702  017034          175450  MOV     R2,     @ISTVEC
021336  062702  000002          000002  MOV     #2,     (R2)
021342  010277  175450          175432  MOV     #PGTE,@ACR      ;ACCESS PGTE REGISTER
021346  012712  000002          175432  MOV     @SWR,R2         ;GET COPY OF SWR
021350  013702  017034          172556  BIC     #177760,R2      ;KEEP ONLY THE CPU MASK
021354  062702  000002          177760  MOV     R2,@ADR         ;SET THE INTERRUPT BITS
021360  010277  175450          175420  BIT     #BIT0,CPUACT    ;EVEN OR ODD?
021364  012712  000002          175420  BEQ     7$              ;BRANCH IF EVEN
021370  012777  000000  175432          MOV     #5,@ADR         ;GO WITH NO PARITY,ENABLE INTERRUPTS
021376  017702  172556          016774  BR      4$
021402  042702  177760          016774  7$:     MOV     #7,@ADR         ;GO WITH PARITY,ENABLE INTS.
021406  010277  175420          175402  4$:     WAIT                    ;WAIT FOR IIST TO INTERRUPT
021412  032737  000001  016774          BIS     #BIT15,@ACR     ;;RESET THE IIST
021420  001404                  175402
021422  012777  000005  175402          BEGIN:
021430  000403                  175372
021432  012777  000007  175372
021440  000001                  175360
021442  052777  100000  175360
021450                          BEGIN:
```

```
                                ;;*****************************************************************************
                                ;;*****************************************************************************
                                ;;*************                                                 *****************
                                ;;*************  S E C T I O N   O N E                          *****************
                                ;;*************                                                 *****************
                                ;;*****************************************************************************
                                ;;*****************************************************************************



                                ;;*****************************************************************
                                ;*TEST 1          SIMPLE DOWN/UP TEST (KERNAL)
                                ;;*****************************************************************
021450                          TST1:
021450  012777  000001  172512          MOV     #1,@DISPLAY     ;SET TEST NUMBER
021456  012737  033774  014662          MOV     #POWDWN,        PWRTAB  ;SET UP POWER DOWN VECTOR
021464  012737  033340  000114          MOV     #PARERR,        @#CACHVEC       ;SET PARITY ERROR VECTOR
021472  012737  000001  033342          MOV     #1,     @#PARFLG        ;SET MULTI PARITY ERROR INDICATOR
021500  012737  040606  000024          MOV     #PWRDIS,@#PWRVEC        ;SET LOC 24
021506  005037  000026                  CLR     @#PWRVEC+2      ;SET LOC 26
021512  032770  000200  014160          BIT     #SW07,  @SWR(R0);SKIP SECTION 1?
021520  001402                          BEQ     1$              ;BRANCH IF NO
021522  000137  024220                  JMP     SEC2            ;ELSE GO TO SEC2
021526  005700                  1$:     TST     R0              ;IS THIS THE MASTER?
021530  001011                          BNE     4$              ;BRANCH IF NO
021532  104401  041605                  TYPE    ,TM14           ;'ENTERING SECTION 1''
021536  105737  016740                  TSTB    UBEF            ;USING THE UBE?
021542  001004                          BNE     4$              ;BRANCH IF YES
021544  104401  041241                  TYPE    ,TM13           ;PRINT INSTRUCTIONS
021550  104401  014333                  TYPE    ,$CRLF
021554                          4$:
021554  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
021560  012703  021616                  MOV     #2$,R3          ;SET POWER UP RETURN
021564  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
021570  001407                          BEQ     64$             ;;BRANCH IF NO
021572  106237  017022                  ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
021576  103375                          BCC     .-4
021600  000241                          CLC
021602  052737  000020  170016          BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
021610                          64$:
021610                          3$:
021610  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
021614  000001                          WAIT                    ;WAIT FOR THE POWER FAIL
021616  010602                  2$:     MOV     SP,R2           ;GET SP
021620  016004  014200                  MOV     $$STP(R0),R4    ;R4 CONTAINS THE STACK INIT. VALUE
021624  162704  000004                  SUB     #4,R4           ;STACK-4
021630  020402                          CMP     R4,R2           ;CHECK STACK
021632  001401                          BEQ     .+4             ;SKIP IF OK
021634  000000                          HALT                    ;SP NOT 'STACK-4''
021636  016006  014200                  MOV     $$STP(R0),SP    ;RESET SP
021642  012402                          MOV     (R4)+,R2        ;GET RETURN ADDRESS
021644  105737  016740                  TSTB    UBEF            ;IS THE UBE BEING USED?
021650  001004                          BNE     72$             ;YES
021652  022702  021616          70$:    CMP     #2$,R2          ;CHECK ADDRESS
```

```
                                        BEQ     .+4                 ;SKIP IF OK
                                        HALT                        ;ADDRESS ON STACK IS WRONG
                                72$:    MOV     (R4),R2             ;GET OLD PS
                                        CMP     #0,R2               ;CHECK OLD PS
                                        BEQ     .+4                 ;SKIP IF OK
                                        HALT                        ;OLD PS IS WRONG
                                        BIT     #SW14,@SWR(R0)      ;LOOP ON TEST?
                                        BNE     TST1                ;LOOP TO TST1

                                ;;**********************************************************************
                                ;*TEST 2         PROGRAM VOLATILITY TEST
                                ;;**********************************************************************
                                TST2:
                                        MOV     #2,@DISPLAY         ;SET TEST NUMBER
                                        CLR     @#PS                ;SET KERNAL MODE
                                        MOV     #10000,R2           ;INIT. COUNTER
                                        MOV     #20000,R3           ;INIT POINTER
                                        CLR     CKSUM(R0)           ;RESET THE CHECKSUM LOCATION
                                1$:     ADD     (R3)+,CKSUM(R0)     ;DO CHECKSUM ON 2ND 4K(W) BANK
                                        ADC     CKSUM(R0)
                                        SOB     R2,1$
                                        MOV     #2$,R3              ;POWER UP RETURN
                                        TSTB    UBEF                ;;USE UNIBUS EXERCISER?
                                        BEQ     64$                 ;;BRANCH IF NO
                                        ASRB    UBELCK              ;LOCK OUT OTHER CPUS FROM PROCEEDING
                                        BCC     .-4
                                        CLC
                                        BIS     #BIT4,@#UBCR2       ;;SET TO POWER FAIL
                                64$:
                                        WAIT                        ;WAIT FOR THE POWER TO FAIL
                                        HALT                        ;BAD
                                2$:     MOV     #10000,R2
                                        MOV     #20000,R3
                                        CLR     R4
                                        ;VERIFY THAT EVERYTHING IS OK
                                3$:     ADD     (R3)+,R4
                                        ADC     R4
                                        SOB     R2,3$
                                        CMP     R4,CKSUM(R0)        ;COMPARE NEW CHECKSUM WITH OLD

                                        BEQ     5$                  ;BRANCH IF OK
                                        HALT                        ;ERROR
                                5$:     MOV     $$STP(R0),SP        ;RESET THE STACK
                                        BIT     #SW14,@SWR(R0)      ;LOOP ON TEST?
                                        BNE     TST2                ;LOOP TO TST2
                                ;;**********************************************************************
                                ;*TEST 3         SIMPLE DOWN/UP TEST (SUPERVISOR)
                                ;;**********************************************************************
                                TST3:
                                        MOV     #3,@DISPLAY         ;SET TEST NUMBER
                                        MOV     #40000,@#PS         ;SET SUPERVISOR MODE
                                        MOV     #2$,R3              ;SET POWER UP RETURN
                                        TSTB    UBEF                ;;USE UNIBUS EXERCISER?
                                        BEQ     64$                 ;;BRANCH IF NO
                                        ASRB    UBELCK              ;LOCK OUT OTHER CPUS FROM PROCEEDING
```

```
1399  022076  103375                        BCC     .-4
1400  022100  000241                        CLC
1401  022102  052737  000020  170016        BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
1402  022110                        64$:
1403  022110                        3$:
1404  022110  012737  040000  177776        MOV     #40000,@#PS     ;SET SUPERVISOR MODE
1405  022116  000001                        WAIT                    ;WAIT FOR THE POWER FAIL
1406  022120  016006  014200        2$:     MOV     $$STP(R0),SP    ;RESET
1407  022124  016004  014200                MOV     $$STP(R0),R4
1408  022130  162704  000004                SUB     #4,R4
1409  022134  012402                        MOV     (R4)+,R2        ;GET RETURN ADDRESS
1410  022136  105737  016740                TSTB    UBEF
1411  022142  001004                        BNE     72$
1412  022144  022702  022120        70$:    CMP     #2$,R2          ;CHECK ADDRESS
1413  022150  001401                        BEQ     .+4             ;SKIP IF OK
1414  022152  000000                        HALT                    ;ADDRESS ON STACK IS WRONG
1415  022154  011402                72$:    MOV     (R4),R2         ;GET OLD PS
1416  022156  022702  040000                CMP     #40000,R2       ;CHECK OLD PS
1417  022162  001401                        BEQ     .+4             ;SKIP IF OK
1418  022164  000000                        HALT                    ;OLD PS IS WRONG
1419  022166                        1$:
1420  022166  032770  040000  014160        BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
1421  022174  001323                        BNE     TST3            ;LOOP TO TST3
1422
1423
1424                                ;;**************************************************************************
1425                                ;*TEST 4         SIMPLE DOWN/UP TEST (USER)
1426                                ;;**************************************************************************
1427  022176                        TST4:
1428  022176  012777  000004  171764        MOV     #4,@DISPLAY     ;SET TEST NUMBER
1429  022204  012737  140000  177776        MOV     #140000,@#PS    ;SET USER MODE
1430  022212  012703  022252                MOV     #2$,R3          ;SET POWER UP RETURN
1431  022216  105737  016740                TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1432  022222  001407                        BEQ     64$             ;;BRANCH IF NO
1433  022224  106237  017022                ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
1434  022230  103375                        BCC     .-4
1435  022232  000241                        CLC
1436  022234  052737  000020  170016        BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
1437  022242                        64$:
1438  022242                        3$:
1439  022242  012737  140000  177776        MOV     #140000,@#PS    ;SET USER MODE
1440  022250  000001                        WAIT                    ;WAIT FOR THE POWER FAIL
1441  022252  016006  014200        2$:     MOV     $$STP(R0),SP    ;RESET SP
1442  022256  016004  014200                MOV     $$STP(R0),R4    ;GET STACK INIT. VALUE
1443  022262  162704  000004                SUB     #4,R4           ;MINUS 4
1444  022266  012402                        MOV     (R4)+,R2        ;GET STACK-4,AUTOINC. STACK
1445  022270  105737  016740                TSTB    UBEF
1446  022274  001004                        BNE     72$
1447  022276  022702  022252        70$:    CMP     #2$,R2          ;CHECK ADDRESS
1448  022302  001401                        BEQ     .+4             ;SKIP IF OK
1449  022304  000000                        HALT                    ;ADDRESS ON STACK IS WRONG
1450  022306  011402                72$:    MOV     (R4),R2         ;GET OLD PS
1451  022310  022702  140000                CMP     #140000,R2      ;CHECK OLD PS
1452  022314  001401                        BEQ     .+4             ;SKIP IF OK
1453  022316  000000                        HALT                    ;OLD PS IS WRONG
1454  022320  032770  040000  014160        BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
```

```
                                BNE     TST4            ;LOOP TO TST4


                        ;;**********************************************************************
                        ;*TEST 5         POWER FAIL WITH ODD ADDRESS
                        ;;**********************************************************************
022330                  TST5:
022330  012777  000005  171632         MOV     #5,@DISPLAY     ;SET TEST NUMBER
022336  005037  177776                 CLR     @#PS            ;SET KERNAL MODE
022342  012760  022400  014702         MOV     #3$,ERRTAB(R0)  ;SET TRAP VECTOR
022350  012703  022426                 MOV     #1$,R3          ;SET RETURN ADDRESS FOR POWER FAIL
022354  105737  016740                 TSTB    UBEF            ;;USE UNIBUS EXERCISER?
022360  001407                         BEQ     64$             ;;BRANCH IF NO
022362  106237  017022                 ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
022366  103375                         BCC     .-4
022370  000241                         CLC
022372  052737  000020  170016         BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
022400                  64$:
022400  016006  014200         3$:     MOV     $$STP(R0),SP    ;RESET STACK
022404  005737  000003                 TST     @#3             ;CAUSE ODD ADDRESS TRAP
022410  105737  016740                 TSTB    UBEF            ;;USE UNIBUS EXERCISER?
022414  001403                         BEQ     65$
022416  042737  000020  170016         BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
022424                  65$:
022424  000000                         HALT                    ;ODD ADDRESS TRAP FAILED
022426  012760  040630  014702  1$:    MOV     #CPUER,ERRTAB(R0)       ;RESET 4
022434  032770  040000  014160.        BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
022442  001332                         BNE     TST5            ;LOOP TO TST5


                        ;;**********************************************************************
                        ;*TEST 6         POWER FAIL IN THE RED ZONE
                        ;;**********************************************************************
022444                  TST6:
022444  012777  000006  171516         MOV     #6,@DISPLAY     ;SET TEST NUMBER
022452  005037  177776                 CLR     @#PS            ;SET KERNAL MODE
022456  012760  022526  014702         MOV     #2$,ERRTAB(R0)  ;SET TRAP REGISTER
022464  012703  022560                 MOV     #1$,R3          ;SET POWER UP RETURN
022470  012706  000002                 MOV     #2,SP           ;SET STACK TO RED ZONE
022474  105737  016740                 TSTB    UBEF            ;;USE UNIBUS EXERCISER?
022500  001407                         BEQ     64$             ;;BRANCH IF NO
022502  106237  017022                 ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
022506  103375                         BCC     .-4
022510  000241                         CLC
022512  052737  000020  170016         BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
022520                  64$:
022520  005037  177776                 CLR     @#PS            ;SET KERNAL MODE
022524  000001                         WAIT                    ;WAIT FOR POWER FAIL TRAP
022526  012737  022534  014662  2$:    MOV     #7$,PWRTAB      ;SET UVEC TO HALT
022534                  7$:
022534  105737  016740                 TSTB    UBEF            ;;USE UNIBUS EXERCISER?
022540  001403                         BEQ     65$
022542  042737  000020  170016         BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
```

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1511  022550                                  65$:
1512  022550  000000                                HALT                            ;ILLEGAL TRAP TO 4
1513  022552  012737  033774  014662                MOV     #POWDWN,PWRTAB  ;RESET DVEC
1514  022560  016006  014200                1$:     MOV     $$STP(R0),SP    ;RESET STACK
1515  022564  012760  040630  014702                MOV     #CPUER,ERRTAB(R0)       ;RESET 4
1516  022572  013702  000002                        MOV     @#2,R2          ;GET FOR TYPING
1517  022576  023727  000002  000000                CMP     @#2,#0          ;IS 2 OK?
1518  022604  001401                                BEQ     .+4             ;SKIP IF OK
1519  022606  000000                                HALT                    ;NO!
1520  022610  013702  000000                        MOV     @#0,R2          ;GET FOR TYPING
1521  022614  022737  040606  000000                CMP     #PWRDIS,@#0     ;IS 0 OK?
1522  022622  001401                                BEQ     .+4             ;SKIP IF OK
1523  022624  000000                                HALT                    ;0 IS WRONG!
1524  022626  032770  040000  014160                BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
1525  022634  001303                                BNE     TST6            ;LOOP TO TST6
1526
1527
1528                                          ;;**********************************************************************
1529                                          ;*TEST 7         POWER FAIL WITH TIME OUT (KERNAL)
1530                                          ;;**********************************************************************
1531  022636                                  TST7:
1532  022636  012777  000007  171324                MOV     #7,@DISPLAY     ;SET TEST NUMBER
1533  022644  005037  177776                        CLR     @#PS            ;SET KERNAL MODE
1534  022650  012760  022706  014702                MOV     #3$,ERRTAB(R0)  ;SET TRAP VECTOR
1535  022656  012703  022740                        MOV     #1$,R3          ;SET UP RETURN ADDRESS FOR POWER FAIL
1536  022662  105737  016740                        TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1537  022666  001407                                BEQ     64$             ;;BRANCH IF NO
1538  022670  106237  017022                        ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
1539  022674  103375                                BCC     .-4
1540  022676  000241                                CLC
1541  022700  052737  000020  170016                BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
1542  022706                                  64$:
1543  022706  016006  014200                3$:     MOV     $$STP(R0),SP    ;SET STACK
1544  022712  005037  177776                        CLR     @#PS            ;SET KERNAL MODE
1545  022716  010037  173000                        MOV     R0,@#173000     ;CAUSE A TIMEOUT
1546  022722  105737  016740                        TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1547  022726  001403                                BEQ     65$
1548  022730  042737  000020  170016                BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
1549  022736                                  65$:
1550  022736  000000                                HALT                    ;TIMEOUT FAILED
1551  022740  016006  014200                1$:     MOV     $$STP(R0),SP    ;SET STACK
1552  022744  012760  040630  014702                MOV     #CPUER,ERRTAB(R0)       ;RESET 4
1553  022752  032770  040000  014160                BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
1554  022760  001326                                BNE     TST7            ;LOOP TO TST7
1555
1556
1557                                          ;;**********************************************************************
1558                                          ;*TEST 10        POWER FAIL IN THE YELLOW ZONE (KERNAL)
1559                                          ;;**********************************************************************
1560  022762                                  TST10:
1561  022762  012777  000010  171200                MOV     #10,@DISPLAY    ;SET TEST NUMBER
1562  022770  005037  177776                        CLR     @#PS            ;SET KERNAL MODE
1563  022774  005037  014602                        CLR     FLAG            ;CLEAR THE FLAG
1564  023000  012760  023070  014702                MOV     #2$,ERRTAB(R0)  ;SET SICK TPAP ADDRESS
1565  023006  012706  000400                        MOV     #400,SP         ;SET STACK TO YELLOW ZONE
1566  023012  012703  023050                        MOV     #1$,R3          ;SET RETURN ADDRESS FOR POWER FAIL
```

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1567  023016  105737  016740            TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1568  023022  001407                    BEQ     64$             ;;BRANCH IF NO
1569  023024  106237  017022            ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
1570  023030  103375                    BCC     .-4
1571  023032  000241                    CLC
1572  023034  052737  000020  170016    BIS     #BIT4,@#UBCR2   ;;SET   ) POWER FAIL
1573  023042                    64$:
1574  023042  005037  177776            CLR     @#PS            ;SET KERNAL MODE
1575  023046  000001                    WAIT                    ;WAIT FOR POWER FAIL
1576  023050                    1$:
1577  023050  105737  016740            TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1578  023054  001403                    BEQ     65$
1579  023056  042737  000020  170016    BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
1580  023064                    65$:
1581  023064  000000                    HALT                    ;POWER FAIL RETURNED TOO SOON
1582  023066  000430                    BR      4$              ;SKIP SP CHECK
1583  023070  012760  040630  014702    2$:     MOV     #CPUER,ERRTAB(R0)       ;RESET 4
1584  023076  005737  014602            TST     FLAG            ;IS THE FIRST INSTRUCTION FLAG SET?
1585  023102  001016                    BNE     5$              ;YES
1586  023104  012737  023112  014662    MOV     #7$,PWRTAB      ;SET UVEC TO HALT
1587  023112                    7$:
1588  023112  105737  016740            TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1589  023116  001403                    BEQ     66$
1590  023120  042737  000020  170016    BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
1591  023126                    66$:
1592  023126  000000                    HALT                    ;NOT ENOUGH OR TOO MANY INSTR. EXEC.
1593  023130  012737  033774  014662    MOV     #POWDWN,PWRTAB  ;SET DVEC
1594  023136  000404                    BR      4$              ;GET OUT
1595  023140  012703  023150            5$:     MOV     #4$,R3          ;SET RETURN
1596  023144  000002                    RTI                     ;GO TO THE POWER FAIL ROUTINE
1597  023146  000000                    HALT                    ;SHOULD NOT RETURN HERE
1598  023150                    4$:
1599  023150  032770  040000  014160            BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
1600  023156  001301                    BNE     TST10           ;LOOP TO TST10
1601
1602
1603                              ;;**************************************************************************
1604                              ;*TEST 11        POWER FAIL WITH RESETS
1605                              ;;**************************************************************************
1606  023160                    TST11:
1607  023160  012777  000011  171002            MOV     #11,@DISPLAY    ;SET TEST NUMBER
1608  023166  005037  177776            CLR     @#PS            ;SET KERNAL MODE
1609  023172  012703  023236            MOV     #1$,R3          ;SET RETURN ADDRESS
1610  023176  016006  014200            MOV     $$STP(R0),SP    ;RESET STACK
1611  023202  105737  016740            TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1612  023206  001407                    BEQ     64$             ;;BRANCH IF NO
1613  023210  106237  017022            ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
1614  023214  103375                    BCC     .-4
1615  023216  000241                    CLC
1616  023220  052737  000020  170016    BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
1617  023226                    64$:
1618  023226  000005                    3$:     RESET           ;RESETS
1619  023230  000005                    RESET                   ;TO WAIT
1620  023232  000005                    RESET                   ;IN
1621  023234  000774                    BR      3$              ;LOOP
1622  023236  016006  014200            1$:     MOV     $$STP(R0),SP    ;RESET STACK
```

```
1623  023242  032770  040000  014160          BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
1624  023250  001343                          BNE     TST11           ;LOOP TO TST11
1625
1626
1627                                  ;;*******************************************************************
1628                                  ;*TEST 12       POWER FAIL WITH ODD ADDRESS (SUPERVISOR)
1629                                  ;;*******************************************************************
1630  023252                          TST12:
1631  023252  012777  000012  170710          MOV     #12,@DISPLAY    ;SET TEST NUMBER
1632  023260  012737  040000  177776          MOV     #40000,@#PS     ;SET SUPERVISOR MODE
1633  023266  012760  023324  014702          MOV     #3$,ERRTAB(R0)  ;SET TRAP VECTOR
1634  023274  012703  023364                  MOV     #1$,R3          ;SET RETURN ADDRESS FOR POWER FAIL
1635  023300  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1636  023304  001407                          BEQ     64$             ;;BRANCH IF NO
1637  023306  106237  017022                  ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
1638  023312  103375                          BCC     .-4
1639  023314  000241                          CLC
1640  023316  052737  000020  170016          BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
1641  023324                          64$:
1642  023324  016006  014200          3$:     MOV     $$STP(R0),SP    ;RESET STACK
1643  023330  012737  040000  177776          MOV     #40000,@#PS     ;SET SUPERVISOR MODE
1644  023336  005737  000003                  TST     @#3             ;CAUSE ODD ADDRESS TRAP
1645  023342  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
1646  023346  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1647  023352  001403                          BEQ     65$
1648  023354  042737  000020  170016          BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
1649  023362                          65$:
1650  023362  000000                          HALT                    ;ODD ADDRESS TRAP FAILED
1651  023364  016006  014200          1$:     MOV     $$STP(R0),SP    ;RESET STACK POINTER
1652  023370  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;RESET 4
1653  023376  032770  040000  014160          BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
1654  023404  001322                          BNE     TST12           ;LOOP TO TST12
1655
1656
1657                                  ;;*******************************************************************
1658                                  ;*TEST 13       POWER FAIL WITH TIME OUT (SUPERVISOR)
1659                                  ;;*******************************************************************
1660  023406                          TST13:
1661  023406  012777  000013  170554          MOV     #13,@DISPLAY    ;SET TEST NUMBER
1662  023414  012737  040000  177776          MOV     #40000,@#PS     ;SET SUPERVISOR MODE
1663  023422  012760  023460  014702          MOV     #3$,ERRTAB(R0)  ;SET TRAP VECTOR
1664  023430  012703  023520                  MOV     #1$,R3          ;SET UP RETURN ADDRESS FOR POWER FAIL
1665  023434  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1666  023440  001407                          BEQ     64$             ;;BRANCH IF NO
1667  023442  106237  017022                  ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
1668  023446  103375                          BCC     .-4
1669  023450  000241                          CLC
1670  023452  052737  000020  170016          BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
1671  023460                          64$:
1672  023460  016006  014200          3$:     MOV     $$STP(R0),SP    ;RESET STACK
1673  023464  012737  040000  177776          MOV     #40000,@#PS     ;SET SUPERVISOR MODE
1674  023472  010037  173000                  MOV     R0,@#173000     ;CAUSE A TIMEOUT
1675  023476  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
1676  023502  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
1677  023506  001403                          BEQ     65$
1678  023510  042737  000020  170016          BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
```

```
                                65$:
023516                                  HALT                            ;TIMEOUT FAILED
023516  000000                  1$:     MOV     $$STP(R0),SP            ;RESET STACK
023520  016006  014200                   MOV     #CPUER,ERRTAB(R0)               ;RESET 4
023524  012760  040630  014702           BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
023532  032770  040000  014160           BNE     TST13                   ;LOOP TO TST13
023540  001322
                                ;;**************************************************************************
                                ;*TEST 14        POWER FAIL WITH ODD ADDRESS (USER)
                                ;;**************************************************************************
023542                          TST14:
023542  012777  000014  170420           MOV     #14,@DISPLAY    ;SET TEST NUMBER
023550  012737  140000  177776           MOV     #140000,@#PS    ;SET USER MODE
023556  012760  023614  014702           MOV     #3$,ERRTAB(R0)  ;SET TRAP VECTOR
023564  012703  023654                   MOV     #1$,R3                  ;SET RETURN ADDRESS FOR POWER FAIL
023570  105737  016740                   TSTB    UBEF                    ;;USE UNIBUS EXERCISER?
023574  001407                           BEQ     64$                     ;;BRANCH IF NO
023576  106237  017022                   ASRB    UBELCK                  ;LOCK OUT OTHER CPUS FROM PROCEEDING
023602  103375                           BCC     .-4
023604  000241                           CLC
023606  052737  000020  170016           BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
023614                          64$:
023614  016006  014200          3$:     MOV     $$STP(R0),SP    ;RESET STACK
023620  012737  140000  177776           MOV     #140000,@#PS    ;SET USER MODE
023626  005737  000003                   TST     @#3                     ;CAUSE ODD ADDRESS TRAP
023632  005037  177776                   CLR     @#PS                    ;SET KERNAL MODE
023636  105737  016740                   TSTB    UBEF                    ;;USE UNIBUS EXERCISER?
023642  001403                           BEQ     65$
023644  042737  000020  170016           BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
023652                          65$:
023652  000000                          HALT                            ;ODD ADDRESS TRAP FAILED
023654  016006  014200          1$:     MOV     $$STP(R0),SP    ;RESET SP
023660  012760  040630  014702           MOV     #CPUER,ERRTAB(R0)               ;RESET 4
023666  032770  040000  014160           BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
023674  001322                           BNE     TST14                   ;LOOP TO TST14
                                ;;**************************************************************************
                                ;*TEST 15        POWER FAIL WITH TIME OUT (USER)
                                ;;**************************************************************************
023676                          TST15:
023676  012777  000015  170264           MOV     #15,@DISPLAY    ;SET TEST NUMBER
023704  012737  140000  177776           MOV     #140000,@#PS    ;SET USER MODE
023712  012760  023750  014702           MOV     #3$,ERRTAB(R0)  ;SET TRAP VECTOR
023720  012703  024010                   MOV     #1$,R3                  ;SET UP RETURN ADDRESS FOR POWER FAIL
023724  105737  016740                   TSTB    UBEF                    ;;USE UNIBUS EXERCISER?
023730  001407                           BEQ     64$                     ;;BRANCH IF NO
023732  106237  017022                   ASRB    UBELCK                  ;LOCK OUT OTHER CPUS FROM PROCEEDING
023736  103375                           BCC     .-4
023740  000241                           CLC
023742  052737  000020  170016           BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
023750                          64$:
023750  016006  014200          3$:     MOV     $$STP(R0),SP    ;RESET STACK
023754  012737  140000  177776           MOV     #140000,@#PS    ;SET USER MODE
023762  010037  173000                   MOV     R0,@#173000     ;CAUSE A TIMEOUT
```

```
                                                                I 4
 1735  023766  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
 1736  023772  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
 1737  023776  001403                          BEQ     65$
 1738  024000  042737  000020  170016          BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
 1739  024006                          65$:
 1740  024006  000000                          HALT                    ;TIMEOUT FAILED
 1741  024010  016006  014200          1$:     MOV     $$STP(R0),SP    ;RESET STACK
 1742  024014  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;RESET 4
 1743  024022  032770  040000  014160          BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
 1744  024030  001322                          BNE     TST15           ;LOOP TO TST15
 1745
 1746
 1747                                  ;;*****************************************************************
 1748                                  ;*TEST 16       MEMORY MANAGEMENT ABORT TEST
 1749                                  ;;*****************************************************************
 1750  024032                          TST16:
 1751  024032  012777  000016  170130          MOV     #16,@DISPLAY    ;SET TEST NUMBER
 1752  024040  005037  177776                  CLR     @#PS            ;SET KERNAL MODE
 1753  024044  012760  004000  014612          MOV     #TI,    PFFT(R0)        ;TIME THIS POWER FAIL
 1754  024052  012760  024152  014702          MOV     #4$,ERRTAB(R0)  ;SET FOR TIMEOUT
 1755  024060  004737  033406                  JSR     PC,MAP          ;MAP THE WORLD
 1756  024064  012737  024126  000250          MOV     #3$,@#MMVEC     ;SET MEMORY MANAGEMENT VECTOR
 1757  024072  012703  024154                  MOV     #1$,R3          ;LOAD PF RETURN
 1758  024076  005237  177572                  INC     @#MMR0          ;TURN MEMORY MANAGEMENT ON
 1759  024102  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
 1760  024106  001407                          BEQ     64$             ;;BRANCH IF NO
 1761  024110  106237  017022                  ASRB    UBELCK          ;LOCK OUT OTHER CPUS FROM PROCEEDING
 1762  024114  103375                          BCC     .-4
 1763  024116  000241                          CLC
 1764  024120  052737  000020  170016          BIS     #BIT4,@#UBCR2   ;;SET TO POWER FAIL
 1765  024126                          64$:
 1766  024126  016006  014200          3$:     MOV     $$STP(R0),SP    ;ZAP STACK
 1767  024132  005237  140000                  INC     @#140000        ;ACCESS VIOLATION
 1768  024136  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
 1769  024142  001403                          BEQ     65$
 1770  024144  042737  000020  170016          BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
 1771  024152                          65$:
 1772  024152  000000                  4$:     HALT                    ;NO VIOLATION OR TRAP TO 4
 1773
 1774  024154  005037  177572          1$:     CLR     @#MMR0          ;TURN OFF MEMORY MANAGEMENT
 1775  024160  016006  014200          2$:     MOV     $$STP(R0),SP    ;MAKE A NEW STACK
 1776  024164  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;RESET 4
 1777  024172  032770  040000  014160          BIT     #SW14,@SWR(R0)  ;LOOP ON TEST?
 1778  024200  001314                          BNE     TST16           ;LOOP TO TST16
 1779  024202  005077  167762                  CLR     @DISPLA         ;CLEAR THE DISPLAY REGISTER.
 1780  024206  105737  016737                  TSTB    MPF             ;MP MODE?
 1781  024212  001002                          BNE     5$              ;BRANCH IF YES
 1782  024214  000137  035326                  JMP     $EOP            ;UUMP INTO EOP
 1783  024220                          5$:
 1784
 1785
 1786
 1787
 1788
 1789
 1790
```

```
                        ;*****************************************************************************
                        ;*****************************************************************************
                        ;******************                                        ***************
                        ;******************  S E C T I O N  T W O                  ***************
                        ;******************                                        ***************
                        ;*****************************************************************************
                        ;*****************************************************************************


                                .SBTTL  SECTION 2 INITIALIZATION
024220  012703  024244  SEC2:   MOV     #1$,    R3              ;SET UP POWER FAIL RETURN IN CASE
024224  106237  016776          ASRB    SYNC.3                  ;CONTROL THE ENTRY
024230  103373                  BCC     SEC2
024232  005237  016716          INC     S2LOG1                  ;LOG INTO SEC2
024236  012737  000001  016776  MOV     #1,     SYNC.3          ;LET THE OTHERS IN
024244  023737  016716  016774  1$:     CMP     S2LOG1,CPUACT           ;;WAIT FOR EVERYONE TO GET ...
024252  001374                  BNE     1$                      ;;HERE
024254  005700                  TST     R0                      ;;IS THIS THE MASTER?
024256  001002                  BNE     3$                      ;;BRANCH IF NO
024260  104401  041635          TYPE    ,TM15                   ;;'ENTERING SECTION 2''
024264                  3$:
024264  052777  100000  172536  BIS     #BIT15, @ACR            ;INITIALIZE IIST
024272  016006  014200          MOV     $$STP(R0),      SP      ;SET THE STACK
024276  106237  017026  2$:     ASRB    S2L1                    ;;TRY TO ENTER SECTION 2 INITIALIZATION
024302  103375                  BCC     2$
024304  012737  034464  000024  MOV     #$POWER,@#24            ;;SET NEW POWER FAIL HANDLER
024312  012737  000340  000026  MOV     #340,@#26
024320  017705  172504          MOV     @ACR,   R5      ;COPY ACR
024324  072527  177770          ASH     #-10,   R5      ;GET THE ID
024330  010560  014240          MOV     R5,     $REGO(R0);IDENTIFY CPU FOR ERROR TYPE-OUT
024334  005002                  CLR     R2              ;RESET FOR COUNT
024336  026205  014226  65$:    CMP     $CPUID(R2),R5   ;SID MATCH?
024342  001404                  BEQ     64$
024344  005722                  TST     (R2)+           ;INCREMENT R2 BY 2
024346  020227  000010          CMP     R2,#10
024352  002771                  BLT     65$
024354  010200          64$:    MOV     R2,R0           ;MOV LOGICAL ID TO 2ND OPERAND
024356  010001                  MOV     R0,     R1              ;SET UP R1
024360  006201                  ASR     R1
024362  012760  034656  014662  MOV     #$PWRDN,        PWRTAB(R0)      ;SET UP FOR POWER DOWN
```

```
1847  024370  012760  024664  014702  SIZMBS: MOV     #NORP,ERRTAB(R0)        ;;SET UP CPU ERROR VECTOR IN CASE
1848                                                                          ;;THERE'S NO RP0/5/6
1849  024376  052737  000040  176710          BIS     #BIT5,@#RPCS2           ;;INIT. RP CONTROLLER,IF THERE.
1850  024404  012760  040630  014702          MOV     #CPUER,ERRTAB(R0)       ;;RESET ERROR VECTOR
1851  024412  005002                          CLR     R2                      ;;RESET COUNTER
1852  024414  010237  176710          RPSRC:  MOV     R2,@#RPCS2              ;;SET DRIVE # IN CS REG.
1853  024420  032737  040000  176712          BIT     #BIT14,@#RPDS           ;;IS THE DRIVE UP?
1854  024426  001024                          BNE     NXTDRV                  ;;BRANCH IF IT ISN'T
1855
1856  024430  032737  001000  176712          BIT     #BIT9,@#RPDS            ;;IS THE PGM BIT SET FOR THIS DRIVE
1857  024436  001403                          BEQ     1$
1858  024440  005260  016742                  INC     RPPGM(R0)               ;;YES, FLAG THE CONDITION
1859  024444  000415                          BR      NXTDRV                  ;;AND, SEARCH FOR ANOTHER DRIVE
1860  024446  032737  000400  176712  1$:     BIT     #BIT8,@#RPDS            ;;IS THIS PORT IN CONTROL?
1861  024454  001411                          BEQ     NXTDRV                  ;;NO, LOOK FOR ANOTHER
1862  024456  005060  014632                  CLR     MBDSW(R0)               ;;CLEAR MASSBUSS DEVICE SELECTION
1863  024462  013703  176710                  MOV     @#RPCS2,R3              ;;COPY CS2
1864  024466  042703  177770                  BIC     #177770,R3              ;;GET RID OF OTHER INFO
1865  024472  110360  014632                  MOVB    R3,MBDSW(R0)            ;;WRITE DRIVE ID INTO SELECTION W
1866  024476  000454                          BR      SIZEND                  ;;DEVICE HAS BEEN FOUND.
1867  024500  005202          NXTDRV: INC     R2                              ;;NEXT DRIVE
1868  024502  020227  000010                  CMP     R2,#10                  ;;ALL DRIVES TESTED?
1869  024506  103742                          BLO     RPSRC                   ;;NO, TEST SOME MORE.
1870  024510  005760  016742                  TST     RPPGM(R0)               ;;ANY PROGRAMMABLE DRIVES?
1871  024514  001011                          BNE     A                       ;;YES.
1872  024516  104401  041750  NORH70: TYPE    ,TM101                          ;;'NO MASSBUS DEVICE AVAILABLE ON CPU #''
1873  024522  016046  014226                  MOV     $CPUID(R0),-(SP)        ;;SAVE $CPUID(R0) FOR TYPEOUT
1874  024526  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
1875  024530  012760  001400  014632          MOV     #1400,MBDSW(R0)         ;;SET CODE FOR NO DEVICE
1876  024536  000434                          BR      SIZEND                  ;;EXIT SECTION 2 INITIALIZATION
1877  024540  005002          A:      CLR     R2                              ;;RESET COUNTER
1878  024542  010237  176710  10$:    MOV     R2,@#RPCS2                      ;;ACCESS DRIVE.
1879  024546  032737  001000  176712          BIT     #BIT9,@#RPDS            ;;PGM BIT SET?
1880  024554  001005                          BNE     15$                     ;;YES, FOUND ONE
1881  024556  005202                          INC     R2                      ;;NO, NEXT DRIVE
1882  024560  020227  000010                  CMP     R2,#10                  ;;ALL DRIVE TESTED
1883  024564  103766                          BLO     10$                     ;;NO.
1884  024566  000000                          HALT                            ;;YES.
1885  024570  110260  014632  15$:    MOVB    R2,MBDSW(R0)                    ;;SET DRIVE #
1886  024574  052760  001000  014632          BIS     #BIT9,MBDSW(R0)         ;;SET PGMBIT
1887  024602  104401  043752                  TYPE    ,$PGM1                  ;TYPE SHARED DRIVE WARNING MSG
1888  024606  010246                          MOV     R2,     -(SP)
1889  024610  104405                          TYPDS
1890  024612  104401  044000                  TYPE    ,$PGM2
1891  024616  016046  014226                  MOV     $CPUID(R0),     -(SP)
1892  024622  104405                          TYPDS
1893  024624  104401  044014                  TYPE    ,$PGM3
1894  024630  012737  000001  017026  SIZEND: MOV     #1,S2L1                 ;;ALLOW ENTRY INTO SEC. 2
1895  024636  005237  016720                  INC     S2LOG2                  ;;LOG OUT OF SECTION 2 INITIALIZATION
1896  024642  023737  016774  016720  1$:     CMP     CPUACT,S2LOG2           ;WAIT FOR ALL THE CPUS TO GET HERE
1897  024650  001374                          BNE     1$
1898  024652  012777  040602  172154          MOV     #ISTDIS,@ISTVEC         ;;POINT TO DISPATCHER
1899  024660  000137  024674                  JMP     TST17                   ;START THE TEST
1900
1901  024664  000240          NORP:   NOP                                     ;THERE IS NO RP CONTROLLER
1902  024666  012716  024516                  MOV     #NORH70,(SP)            ;;SET FOR TEST ENTRY RETURN
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1903  024672  000002                          RTI                                 ;;RETURN
1904
1905
1906
1907
1908
1909
1910
1911
1912
1913                                  ;;*****************************************************************
1914                                  ;*TEST 17       CHECK 'BRK' & 'DCF' FLAGS DURING POWERFAIL
1915                                  ;;*****************************************************************
1916  024674                          TST17:
1917  024674  012777  000017  167266          MOV     #17,@DISPLAY    ;SET TEST NUMBER
1918
1919                                  ;;***************** TS17A-FORK ****************************
1920
1921  024702  016006  014200                  MOV     $$STP(R0),      SP;SET UP THE STACK
1922  024706  052777  100000  172114          BIS     #BIT15, @ACR    ;INITIALIZE THE IIST
1923  024714  106277  000126          70$:    ASRB    @69$            ;ENTER CONTROL FORK
1924  024720  103375                          BCC     70$
1925  024722  027737  000114  016774          CMP     @67$,CPUACT             ;HAVE WE REACHED THE END OF THE
1926                                                                  ;ROUTING CYCLE?
1927  024730  001021                          BNE     65$             ;BRANCH IF NO
1928  024732  013702  016774                  MOV     CPUACT,R2
1929  024736  005302                          DEC     R2
1930  024740  006302                          ASL     R2              ;(CPUACT-1)*2
1931  024742  027702  000076                  CMP     @68$,R2         ;ARE WE AT THE END OF THE TEST?
1932  024746  001005                          BNE     64$             ;BRANCH IF NO
1933  024750  012777  000001  000070          MOV     #1,     @69$    ;EXIT
1934  024756  000137  025524                  JMP     TST20
1935  024762  062777  000002  000054  64$:    ADD     #2,     @68$            ;INCREMENT 68$ BY 2
1936  024770  005077  000046                  CLR     @67$            ;CLEAR THE CHECKPOINT COUNTER
1937  024774  005277  000042          65$:    INC     @67$            ;INCREMENT CHECKPOINT
1938  025000  005037  014642                  CLR     SIGNAL          ;CLEAR SIGNAL LOCK
1939  025004  005037  014714                  CLR     SYNC.2          ;CLEAR THE LOCK
1940  025010  020077  000030                  CMP     R0,@68$         ;ROUTE THIS PROCESSOR THROUGH TS17A?
1941  025014  001005                          BNE     66$             ;BRANCH IF NO
1942  025016  012777  000001  000022          MOV     #1,@69$         ;CLEAR LOCK
1943  025024  000137  025050                  JMP     TS17A           ;JUMP TO BRANCH TS17A
1944  025030  012777  000001  000010  66$:    MOV     #1,@69$         ;CLEAR LOCK
1945  025036  000137  025172                  JMP     TS17B           ;JUMP TO TS17B
1946                                  ;;*************************************************************
1947  025042  016722                  67$:    C1
1948  025044  016724                  68$:    C2
1949  025046  017004                  69$:    C3
1950
1951  025050  112761  000017  014002  TS17A:  MOVB    #17,    $TSTNM(R1)      ;SET UP THE TEST NUMBER
1952  025056  010037  017062                  MOV     R0,PUT          ;SET PROCESSOR UNDER TEST
1953  025062  005700                          TST     R0              ;IS THIS THE MASTER?
1954  025064  001007                          BNE     5$              ;BRANCH IF NO
1955  025066  104401  041713                  TYPE    ,TM77           ;"TEST"
1956  025072  005046                          CLR     -(SP)
1957  025074  116116  014002                  MOVB    $TSTNM(R1),(SP) ;GET THE TEST NO.
1958  025100  104403                          TYPOS
```

```
1959  025102  000002                        .WORD   2                       ;TYPE 2 DIGITS, NO LEADING 0
1960  025104                          5$:
1961  025104  104401  041724                TYPE    ,TM100          ;'POWER FAIL CPU #''
1962  025110  016046  014226                MOV     $CPUID(R0),-(SP)        ;;SAVE $CPUID(R0) FOR TYPEOUT
1963  025114  104405                        TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
1964  025116  104401  014333                TYPE    ,$CRLF
1965  025122  012760  014020  014612        MOV     #SSU!TI!NCX,PFFT(R0)    ;SEND SIG. ON UP, TIME, DON'T SAVE MM
1966  025130  012760  025160  014672        MOV     #BAD,ISTTAB(R0) ;SET UP IIST VECTOR FOR THIS CPU.
1967  025136  005003                        CLR     R3                      ;RETURN AFTER THE WAIT ON POWER UP
1968  025140  005037  014642                CLR     SIGNAL                  ;CLEAR THE POWER UP SIGNAL
1969  025144  012737  000001  014714        MOV     #1,     SYNC.2          ;UNLOCK THE OTHER CPUS
1970  025152  000001                        WAIT                    ;WAIT FOR THE POWER TO FAIL.
1971  025154  000137  024674                JMP     TST17                   ;GO TO CONTROL FORK
1972
1973
1974  025160  104025                  BAD:  ERROR   25                       ;UNEXPECTED CPU INTERRUPT
1975  025162  000000                        HALT
1976  025164  012716  024674                MOV     #TST17, (SP)            ;CONTINUE TESTING
1977  025170  000002                        RTI
1978
1979  025172  112761  000017  014002  TS17B:  MOVB    #17,    $TSTNM(R1)      ;SET UP THE TEST NUMBER
1980  025200  106237  014714                ASRB    SYNC.2          ;WAIT FOR P.U.T. TO SEND SIGNAL
1981  025204  103372                        BCC     TS17B           ;LOOP UNTIL SENT
1982  025206  005237  016764                INC     LOG1            ;COUNT CPU'S COMING THRU
1983  025212  023737  016764  016770        CMP     LOG1,CPULS1     ;ALLHERE?
1984  025220  001404                        BEQ     2$              ;YES - SKIP
1985  025222  012737  000001  014714        MOV     #1,SYNC.2       ;NO, LET NEXT ONE IN
1986  025230  000402                        BR      5$              ;THEN CONTINUE
1987  025232  005037  016764            2$: CLR     LOG1            ;LAST ONE INITIALIZES COUNTER
1988  025236  104401  014220            5$: TYPE    ,$NULL          ;FLUSH THE TYPE QUEUE
1989  025242  012760  025160  014672        MOV     #BAD,   ISTTAB(R0)      ;GET SET FOR BAD INTERRUPT
1990  025250  012777  000001  171552        MOV     #PGCS,@ACR      ;ACCESS PGCS REGISTER
1991  025256  052777  000004  171546        BIS     #BIT2,@ADR      ;SET THE INTERRUPT ENABLE BIT
1992
1993  025264  012777  000007  171536        MOV     #DCF,@ACR       ;COPY THE DCF REG.
1994  025272  017705  171534                MOV     @ADR,R5 ;INTO R5
1995  025276  012760  025376  014672        MOV     #STS17, ISTTAB(R0)      ;SET FOR EXPECTED INTERRUPT
1996  025304  106237  014642            1$: ASRB    SIGNAL          ;WAIT ON POWER FAIL SIGNAL
1997  025310  103375                        BCC     1$              ;
1998  025312  012737  000001  014642        MOV     #1,SIGNAL       ;LET ANOTHER IN
1999  025320  017760  171504  014250        MOV     @ACR,$REG1(R0)  ;SAVE THE ACR
2000  025326  012777  000000  171474        MOV     #PGTE,@ACR      ;ACCESS THE PGTE REG.
2001  025334  017760  171472  014260        MOV     @ADR,$REG2(R0)  ;SAVE THE PGTE REG.
2002  025342  017760  171464  014270        MOV     @ADR,$REG3(R0)  ;SAVE THE PGCS REG.
2003  025350  104020                        ERROR   20              ;NO IIST INTERRUPT
2004  025352  005237  016766                INC     LOG2            ;COUNT CPU'S GOING OUT
2005  025356  023737  016766  016770        CMP     LOG2,CPULS1     ;ALL DONE?
2006  025364  001002                        BNE     10$             ;NO - SKIP
2007  025366  005037  016766                CLR     LOG2            ;YES, INIT FOR NEXT CYCLE
2008  025372  000137  024674           10$: JMP     TST17           ;DO IT AGAIN
2009  025376                          STS17:
2010  025376  012777  000007  171424        MOV     #DCF,@ACR       ;ACCESS DCF REGISTER
2011  025404  013703  017062                MOV     PUT,R3          ;GET LOGICAL ID INTO R3
2012  025410  016304  014226                MOV     $CPUID(R3),R4   ;COPY IIST ID TO DESTINATION.
2013  025414  012703  000401                MOV     #401,R3         ;MAKE A MASK
2014  025420  072304                        ASH     R4,R3           ;BRING IT INTO POSITION
```

```
2015  025422  050305                          BIS     R3,R5           ;R5 IS WHAT THE DCF REG. SHOULD LOOK LIKE
2016  025424  077301                          SOB     R3,             ;DELAY A SHORT WHILE
2017  025426  017702  171400                  MOV     @ADR,R2 ;COPY DCF REGISTER
2018  025432  020205                          CMP     R2,R5           ;EVERYTHING OK?
2019  025434  001405                          BEQ     3$              ;BRANCH IF YES
2020  025436  010260  014250                  MOV     R2,$REG1(R0)    ;THE DCF REG.
2021  025442  010560  014260                  MOV     R5,$REG2(R0)    ;WHAT IT SHOULD BE
2022  025446  104021                          ERROR   21              ;INCORRECT DCF REG. BITS
2023  025450  005060  017012          3$:     CLR     NOPRMP(R0)
2024  025454  104401  045163                  TYPE    ,TM111          ;INTERRUPT AS EXPECTED
2025  025460  106237  014712          4$:     ASRB    SYNC.1          ;WAIT FOR POWER-UP
2026  025464  103375                          BCC     4$
2027  025466  005237  016766                  INC     LOG2            ;COUNT CPU'S GOING OUT
2028  025472  023737  016766  016770          CMP     LOG2,CPULS1     ;ALL DONE?
2029  025500  001404                          BEQ     6$              ;YES - SKIP
2030  025502  012737  000001  014712          MOV     #1,SYNC.1       ;ELSE LLET NEXT ONE IN
2031  025510  000402                          BR      7$
2032  025512  005037  016766          6$:     CLR     LOG2            ;LAST ONE INITS COUNTER
2033  025516  012716  024674          7$:     MOV     #TST17, (SP)    ;CONTINUE
2034  025522  000002                          RTI
2035
2036
2037
2038
2039                                  ;;*******************************************************************
2040                                  ;*TEST 20       CHECK POWERFAIL DURING HIGH MEMORY ACTIVITY
2041                                  ;;*******************************************************************
2042  025524                          TST20:
2043  025524  012777  000020  166436          MOV     #20,@DISPLAY    ;SET TEST NUMBER
2044                                          ;;***************** TS20A-FORK ****************************
2045
2046  025532  016006  014200                  MOV     $$STP(R0),      SP;SET UP THE STACK
2047  025536  052777  100000  171264          BIS     #BIT15, @ACR    ;INITIALIZE THE IIST
2048  025544  106277  000122          70$:    ASRB    @69$            ;ENTER CONTROL FORK
2049  025550  103375                          BCC     70$
2050  025552  027737  000110  016774          CMP     @67$,CPUACT             ;HAVE WE REACHED THE END OF THE
2051                                          ;ROUTING CYCLE?
2052  025560  001021                          BNE     65$             ;BRANCH IF NO
2053  025562  013702  016774                  MOV     CPUACT,R2
2054  025566  005302                          DEC     R2
2055  025570  006302                          ASL     R2              ;(CPUACT-1)*2
2056  025572  027702  000072                  CMP     @68$,R2         ;ARE WE AT THE END OF THE TEST?
2057  025576  001005                          BNE     64$             ;BRANCH IF NO
2058  025600  012777  000001  000064          MOV     #1,     @69$    ;EXIT
2059  025606  000137  026114                  JMP     TST21
2060  025612  062777  000002  000050  64$:    ADD     #2,     @68$            ;INCREMENT 68$ BY 2
2061  025620  005077  000042                  CLR     @67$            ;CLEAR THE CHECKPOINT COUNTER
2062  025624  005277  000036          65$:    INC     @67$            ;INCREMENT CHECKPOINT
2063  025630  005037  014714                  CLR     SYNC.2          ;CLEAR THE LOCK
2064  025634  020077  000030                  CMP     R0,@68$         ;ROUTE THIS PROCESSOR THROUGH TS20A?
2065  025640  001005                          BNE     66$             ;BRANCH IF NO
2066  025642  012777  000001  000022          MOV     #1,@69$         ;CLEAR LOCK
2067  025650  000137  025674                  JMP     TS20A           ;JUMP TO BRANCH TS20A
2068  025654  012777  000001  000010  66$:    MOV     #1,@69$         ;CLEAR LOCK
2069  025662  000137  026006                  JMP     TS20B           ;JUMP TO TS20B
2070                                          ;;*************************************************************
```

```
                                67$:    D1
                                68$:    D2
                                69$:    D3
025674  112761  000020  014002  TS20A:  MOVB    #20,    $TSTNM(R1)
025702  010037  017062                  MOV     R0,PUT          ;SET PROCESSOR UNDER TEST
025706  005700                          TST     R0              ;IS THIS THE MASTER?
025710  001007                          BNE     5$              ;BRANCH IF NO
025712  104401  041713                  TYPE    ,TM77           ;'TEST'
025716  005046                          CLR     -(SP)
025720  116116  014002                  MOVB    $TSTNM(R1),(SP) ;GET THE TEST NO.
025724  104403                          TYPOS
025726  000002                          .WORD   2                       ;TYPE 2 DIGITS, NO LEADING 0
025730                          5$:
025730  104401  041724                  TYPE    ,TM100          ;'POWERFAIL CPU # ''
025734  016046  014226                  MOV     $CPUID(R0),-(SP)        ;;SAVE $CPUID(R0) FOR TYPEOUT
025740  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
025742  104401  014333                  TYPE    ,$CRLF
025746  012760  014020  014612          MOV     #SSU!TI!NCX,PFFT(R0) ;SEND SIGNAL ON UP,TIME,DON'T SAVE NN
025754  005003                          CLR     R3              ;SET FOR RTI RETURN
025756  023737  016726  016774  1$:     CMP     D1,CPUACT       ;MAKE SURE ALL CPU'S DONE WITH
025764  001374                          BNE     1$              ;PREVIOUS CYCLE
025766  005037  014642                  CLR     SIGNAL          ;CLEAR THE POWER-UP SIGNAL
025772  012737  000001  014714          MOV     #1,     SYNC.2  ;UNLOCK THE OTHER CPUS
026000  000001                          WAIT                    ;WAIT FOR THE POWER TO FAIL
026002  000137  025524                  JMP     TST20

026006  112761  000020  014002  TS20B:  MOVB    #20,    $TSTNM(R1);SET UP THE TEST NUMBER
026014  106237  014714                  ASRB    SYNC.2          ;WAIT FOR SYNC. SIGNAL
026020  103372                          BCC     TS20B
026022  005237  016764                  INC     LOG1            ;COUNT CPU'S GOING THRU
026026  023737  016764  016770          CMP     LOG1,CPULS1     ;LAST ONE HERE?
026034  001404                          BEQ     3$              ;YES - SKIP
026036  012737  000001  014714          MOV     #1,SYNC.2       ;ELSE LET NEXT ONE IN
026044  000402                          BR      4$
026046  005037  016764          3$:     CLR     LOG1            ;LAST ONE INITS COUNTER
026052  104401  014220          4$:     TYPE    ,$NULL          ;FLUSH THE TYPE QUEUE
026056  012705  002000          1$:     MOV     #2000,R5        ;INITIALIZE COUNTER
026062  011010                  2$:     MOV     (R0),(R0)
026064  011010                          MOV     (R0),(R0)
026066  011010                          MOV     (R0),(R0)
026070  011010                          MOV     (R0),(R0)
026072  077505                          SOB     R5,2$
026074  106237  014642                  ASRB    SIGNAL          ;SIGNAL RECEIVED?
026100  103366                          BCC     1$              ;NO,CONTINUE WITH CONTENSION
026102  012737  000001  014642          MOV     #1,SIGNAL       ;OPEN LOCK FOR NEXT CPU
026110  000137  025524                  JMP     TST20


                        ;;**********************************************************************
                        ;*TEST 21       CHECK POWERFAIL SEQUENCE DURING MASSBUS XFER
                        ;;**********************************************************************
026114                  TST21:
026114  012777  000021  166046          MOV     #21,@DISPLAY    ;SET TEST NUMBER
                        ;;***************** TS21A-FORK ****************************
```

```
2127
2128  026122  016006  014200                  MOV     $$STP(R0),      SP;SET UP THE STACK
2129  026126  052777  100000  170674          BIS     #BIT15, @ACR    ;INITIALIZE THE IIST
2130  026134  106277  000126          70$:    ASRB    @69$            ;ENTER CONTROL FORK
2131  026140  103375                          BCC     70$
2132  026142  027737  000114  016774          CMP     @67$,CPUACT             ;HAVE WE REACHED THE END OF THE
2133                                                                  ;ROUTING CYCLE?
2134  026150  001021                          BNE     65$             ;BRANCH IF NO
2135  026152  013702  016774                  MOV     CPUACT,R2
2136  026156  005302                          DEC     R2
2137  026160  006302                          ASL     R2              ;(CPUACT-1)*2
2138  026162  027702  000076                  CMP     @68$,R2         ;ARE WE AT THE END OF THE TEST?
2139  026166  001005                          BNE     64$             ;BRANCH IF NO
2140  026170  012777  000001  000070          MOV     #1,     @69$    ;EXIT
2141  026176  000137  027076                  JMP     TST22
2142  026202  062777  000002  000054  64$:    ADD     #2,     @68$            ;INCREMENT 68$ BY 2
2143  026210  005077  000046                  CLR     @67$            ;CLEAR THE CHECKPOINT COUNTER
2144  026214  005277  000042          65$:    INC     @67$            ;INCREMENT CHECKPOINT
2145  026220  005037  014712                  CLR     SYNC.1          ;CLEAR ALL THE LOCKS
2146  026224  005037  014714                  CLR     SYNC.2          ;CLEAR THE LOCK
2147  026230  020077  000030                  CMP     R0,@68$         ;ROUTE THIS PROCESSOR THROUGH TS21A?
2148  026234  001005                          BNE     66$             ;BRANCH IF NO
2149  026236  012777  000001  000022          MOV     #1,@69$         ;CLEAR LOCK
2150  026244  000137  026270                  JMP     TS21A           ;JUMP TO BRANCH TS21A
2151  026250  012777  000001  000010  66$:    MOV     #1,@69$         ;CLEAR LOCK
2152  026256  000137  026656                  JMP     TS21B           ;JUMP TO TS21B
2153                                          ;;*************************************************************
2154  026262  016732                  67$:    E1
2155  026264  016734                  68$:    E2
2156  026266  017010                  69$:    E3
2157  026270  112761  000021  014002  TS21A:  MOVB    #21,    $TSTNM(R1)
2158  026276  010037  017062                  MOV     R0,PUT                  ;SET PROCESSOR UNDER TEST
2159  026302  023737  016732  016774  4$:     CMP     E1,     CPUACT  ;LET THE OTHER CPUS CATCH UP
2160  026310  001374                          BNE     4$
2161  026312  005700                          TST     R0                      ;IS THIS THE MASTER?
2162  026314  001007                          BNE     5$                      ;BRANCH IF NO
2163  026316  104401  041713                  TYPE    ,TM77                   ;'TEST'
2164  026322  005046                          CLR     -(SP)
2165  026324  116116  014002                  MOVB    $TSTNM(R1),(SP) ;GET THE TEST NO.
2166  026330  104403                          TYPOS
2167  026332  000002                          .WORD   2                               ;TYPE 2 DIGITS, NO LEADING 0
2168  026334                          5$:
2169  026334  013702  016774                  MOV     CPUACT, R2      ;CHECK FOR MASSBUS DEVICES ON OTHER CPUS
2170  026340  006302                          ASL     R2
2171  026342  005005                          CLR     R5
2172  026344  020205                  1$:     CMP     R2,     R5
2173  026346  001407                          BEQ     2$
2174  026350  022765  001400  014632          CMP     #1400,  MBDSW(R5)
2175  026356  001020                          BNE     3$
2176  026360  062705  000002                  ADD     #2,     R5
2177
2178  026364  000767                          BR      1$
2179  026366  104401  044147          2$:     TYPE    ,NODEV                  ;THERE ARE NO DEVICES TO TEST THIS CPU
2180  026372  016046  014226                  MOV     $CPUID(R0),-(SP)                ;;SAVE $CPUID(R0) FOR TYPEOUT
2181  026376  104405                          TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
2182  026400  104401  014333                  TYPE    ,$CRLF
```

```
                                                TYPE    ,TM102                  ;'PROCEEDING TO NEXT CPU''
                                                MOV     #1,     SYNC.2
                                                BR      TST21                   ;BRANCH TO START OF TEST
                                        3$:     CMP     R0,     R5
                                                BNE     P21                     ;BRANCH IF THERE IS A DEVICE ON ANOTHER CPU
                                                ADD     #2,     R5              ;THE DEVICE IS ON THIS CPU '-
                                                BR      1$
                                        P21:    TYPE    ,TM100                  ;'POWER FAIL CPU #''
                                                MOV     $CPUID(R0),-(SP)                ;;SAVE $CPUID(R0) FOR TYPEOUT
                                                TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
                                                TYPE    ,$CRLF
                                                MOV     #SSU!TI!NCX,PFFT(R0) ;SEND SIGNAL ON UP TIME, DON'T SAVE NN
                                                MOV     #1,     SYNC.1  ;UNLOCK THE OTHER CPU'S
                                                CLR     SIGNAL          ;CLEAR THE POWER-UP SIGNAL
                                                CLR     R3              ;COME UP VIA RTI
                                                CMP     #1400,MBDSW(R0) ;DOES THIS CPU HAVE A MASSBUS DEVICE?
                                                BNE     1$              ;BRANCH IF YES
                                                WAIT                    ;WAIT FOR POWER TO FAIL
                                                MOV     #1,     SYNC.2  ;UNLOCK CPUS IF ANY.ARE LOCKED
                                                JMP     TST21           ;GO TO CONTROL FORK
                                        1$:     MOV     BFADR(R0),R4    ;PUT ADDRESS OF BUFFER IN R4
                                                MOV     #70,@#RPCS1     ;DO A READ
                                                JSR     PC,MBUSR        ;READ A RECORD
                                                CLR     CKSUM(R0)       ;CLEAR CHECKSUM LOCATION
                                                MOV     #4000,R2        ;INITIALIZE A COUNTER
                                                MOV     BFADR(R0),R4    ;GET BUFFER POINTER
                                        2$:     ADD     (R4)+,CKSUM(R0) ;PERFORM
                                                ADC     CKSUM(R0)       ;CHECKSUM
                                                SOB     R2,2$           ;LOOP
                                        4$:     MOV     BFADR(R0),R4    ;LOAD BUFFER ADDRESS
                                                MOV     #50,@#RPCS1     ;DO A WRITE CHECK
                                                JSR     PC,MBUSR        ;READ FROM MASS BUS DEVICE

                                                CLR     R5              ;CLEAR R5
                                                MOV     #4000,R2        ;INITIALIZE COUNTER
                                                MOV     BFADR(R0),R4    ;GET POINTER TO BUFFER
                                        5$:     ADD     (R4)+,R5        ;PERFORM
                                                ADC     R5              ;CHECKSUM
                                                SOB     R2,5$           ;
                                                CMP     R5,CKSUM(R0)    ;EVERYTHING OK?
                                                BEQ     6$              ;BRANCH IF YES
                                                ERROR   23              ;CHECKSUM IS WRONG
                                        6$:     ASRB    SIGNAL          ;
                                                BCC     4$              ;NO CONTINUE XFERS
                                                MOV     #1,SIGNAL       ;OPEN LOCK FOR OTHER CPU'S
                                                MOV     #1,SYNC.2       ;UNLICK CPUS IF ANY ARE LOCKED
                                                JMP     TST21           ;GO TO CONTROL FORK
                                TS21B:  MOVB    #21,    $TSTNM(R1)      ;SET THE TEST NUMBER
                                                CMP     #1400,  MBDSW(R0)       ;DOES THIS CPU HAVE A MASSBUS DEVICE?
                                                BNE     1$              ;BRANCH IF YES
                                        10$:    ASRB    SYNC.2          ;ELSE SET OUT THIS ROUND
                                                BCC     10$
                                                MOV     #1,SYNC.2       ;OPEN LOCK FOR OTHERS
                                                TYPE    ,$NULL          ;FLUSH THE TYPE QUEUE
                                                JMP     TST21           ;JUMP INTO THE CONTROL LOOP
                                        1$:
```

```
2239  026720  016004  017042                MOV     BFADR(R0),R4    ;PUT ADDRESS OF BUFFER IN R4
2240  026724  012737  000070  176700        MOV     #70,@#RPCS1     ;DO A READ
2241  026732  004737  033540                JSR     PC,MBUSR        ;READ A RECORD
2242  026736  005060  014650                CLR     CKSUM(R0)               ;CLEAR CHECKSUM LOCATION
2243  026742  012703  004000                MOV     #4000,R3                ;INITIALIZE A COUNTER
2244  026746  016004  017042                MOV     BFADR(R0),R4    ;GET BUFFER POINTER
2245  026752  062460  014650        2$:     ADD     (R4)+,CKSUM(R0) ;PERFORM...
2246  026756  005560  014650                ADC     CKSUM(R0)               ;CHECKSUM.
2247  026762  077305                        SOB     R3,2$           ;LOOP
2248  026764  106237  014712        7$:     ASRB    SYNC.1          ;HOLD UP
2249  026770  103375                        BCC     7$
2250  026772  012737  000001  014712        MOV     #1,SYNC.1       ;OPEN LOCK FOR OTHERS
2251  027000  104401  014220                TYPE    ,$NULL          ;FLUSH THE QUEUE
2252  027004  016004  017042        4$:     MOV     BFADR(R0),R4    ;LOAD BUFFER ADDRESS
2253  027010  012737  000050  176700        MOV     #50,@#RPCS1     ;DO A WRITE CHECK
2254  027016  004737  033540                JSR     PC,MBUSR        ;READ FROM MASS BUS DEVICE
2255  027022  005005                        CLR     R5              ;CLEAR R5
2256  027024  012703  004000                MOV     #4000,R3                ;INITIALIZE COUNTER
2257  027030  016004  017042                MOV     BFADR(R0),R4    ;GET POINTER TO BUFFER
2258  027034  062405                5$:     ADD     (R4)+,R5        ;PERFORM...
2259  027036  005505                        ADC     R5              ;CHECKSUM
2260  027040  077303                        SOB     R3,5$
2261  027042  020560  014650                CMP     R5,CKSUM(R0)    ;EVERYTHING OK?
2262  027046  001401                        BEQ     6$              ;BRANCH IF YES
2263  027050  104023                        ERROR   23              ;CHECKSUM IS WRONG
2264  027052  106237  014642        6$:     ASRB    SIGNAL
2265  027056  103352                        BCC     4$              ;NO CONTINUE XFERS
2266  027060  012737  000001  014642        MOV     #1,SIGNAL       ;OPEN LOCK FOR OTHERS
2267  027066  104401  014220                TYPE    ,$NULL
2268  027072  000137  026114                JMP     TST21           ;JUMP INTO CONTROL LOOP
2269
2270
2271
2272
2273
2274
2275
2276
2277                                ;;*****************************************************************
2278                                ;*TEST 22       CHECK AC POWERFAIL ON MEM BOXES, PORTS DISABLED
2279                                ;;*****************************************************************
2280  027076                        TST22:
2281  027076  012777  000022  165064        MOV     #22,@DISPLAY    ;SET TEST NUMBER
2282
2283  027104  112761  000022  014002        MOVB    #22,    $TSTNM(R1)      ;SET THE TEST NUMBER
2284  027112  106237  016776        2$:     ASRB    SYNC.3                  ;CONTROL THE ENTRY
2285  027116  103375                        BCC     2$
2286  027120  005237  014542                INC     ENTR22                  ;INCREMENT ENTER FLAG
2287  027124  012737  000001  016776        MOV     #1,     SYNC.3          ;ALLOW THE OTHERS IN
2288  027132  023737  016774  014542  1$:   CMP     CPUACT, ENTR22          ;ARE ALL CPUS HERE?
2289  027140  001374                        BNE     1$                      ;NOT YET
2290  027142  005037  014540                CLR     EXIT                    ;CLEAR THE EXIT FLAG
2291  027146  005037  177776                CLR     PSW                     ;SET KERNAL MODE
2292  027152  020027  000000                CMP     R0,     #0              ;IS THIS THE MASTER?
2293  027156  001001                        BNE     TS22B                   ;BRANCH IF NO
2294  027160  000474                        BR      TS22A                   ;THIS IS THE MASTER
```

```
                                                                ;INITIALIZE THE IIST
027162  052777  100000  167640  TS22B:  BIS     #BIT15, @ACR
027170  012777  000022  164772          MOV     #22,    @DISPLAY        ;SET TEST NUMBER
027176  016006  014200                  MOV     $$STP(R0),      SP      ;INITIALIZE THE STACK
027202  005060  014612                  CLR     PFFT(R0)                ;SPECIFY THE POWER FAIL
027206  012760  040630  014702          MOV     #CPUER, ERRTAB(R0)      ;SET FOR UNEXPECTED TRAPS TO 4
027214  012703  027326                  MOV     #100$,  R3              ;SET FOR POWER FAIL RETURN
027220  005737  014540                  TST     EXIT                    ;FINISHED WITH THIS TEST?
027224  001404                          BEQ     1$                      ;BRANCH IF NO
027226  005037  177572                  CLR     MMR0                    ;MAKE SURE MM IS TURNED OFF
027232  000137  030120                  JMP     TST23                   ;GO TO NEXT TEST
027236  005737  014534          1$:     TST     RELOUP                  ;TIME TO RELOCATE?
027242  001421                          BEQ     2$                      ;BRANCH IF NO
027244  004737  032604                  JSR     PC,     SETMM           ;GET READY FOR RELOCATION
027250  063737  014550  172340          ADD     HIBOX,  KIPAR0
027256  063737  014550  172342          ADD     HIBOX,  KIPAR1
027264  063737  014550  172344          ADD     HIBOX,  KIPAR2
027272  052737  000001  177572          BIS     #1,     MMR0            ;SLAVE IS NOW IN HIGH CORE
027300  005037  014534                  CLR     RELOUP                  ;CLEAR RELOCATION FLAG
027304  000726                          BR      TS22B                   ;CONTINUE TESTING
027306  005737  014536          2$:     TST     RELODN                  ;TIME TO RELOCATE?
027312  001723                          BEQ     TS22B                   ;BRANCH IF NO
027314  005037  177572                  CLR     MMR0                    ;RETURN TO LOW CORE
027320  005037  014536                  CLR     RELODN                  ;CLEAR THE FLAG
027324  000716                          BR      TS22B                   ;CONTINUE

027326  005737  014522          100$:   TST     PWRFL                   ;SHOULD WE BE HERE?
027332  001002                          BNE     101$                    ;BRANCH IF YES
027334  104001                          ERROR   1                       ;UNEXPECTED CPU POWER FAIL
027336  000711                          BR      TS22B                   ;CONTINUE TESTING
027340  005060  017012          101$:   CLR     NOPRMP(R0)              ;WANT TO IDENTIFY THE CPU
027344  104401  042052                  TYPE    ,TM103                  ;EXPECTED CPU POWER FAIL
027350  000704                          BR      TS22B                   ;CONTINUE TESTING



027352  TS22A:
027352  005700                          TST     R0              ;IS THIS THE MASTER?
027354  001007                          BNE     5$              ;BRANCH IF NO
027356  104401  041713                  TYPE    ,TM77           ;'TEST'
027362  005046                          CLR     -(SP)
027364  116116  014002                  MOVB    $TSTNM(R1),(SP) ;GET THE TEST NO.
027370  104403                          TYPOS
027372  000002                          .WORD   2                       ;TYPE 2 DIGITS, NO LEADING 0
027374  5$:
027374  012737  000000  014522          MOV     #0,     PWRFL           ;SPECIFY WHETHER OR NOT TO EXPECT CPU POWER FAIL
027402  012737  000000  014526          MOV     #0,     BOOT            ;SPECIFY WHETHER OR NOT TO EXPECT CPU BOOT AND I
027410  004737  032342                  JSR     PC,     MEMSIZ          ;FIND ALL THE MEM BOXES
027414  005737  014540                  TST     EXIT                    ;WAS ONLY ONE MEM BOX FOUND?
027420  001402                          BEQ     1$                      ;BRANCH IF NO
027422  000137  030120                  JMP     TST23                   ;WE CAN'T DO THIS TEST
027426  012702  000016          1$:     MOV     #16,    R2              ;POINT TO BOX #7
027432  052777  100000  167370  2$:     BIS     #BIT15, @ACR            ;INITIALIZE THE IIST
027440  012777  000022  164522          MOV     #22,    @DISPLAY        ;SET THE TEST NUMBER
027446  016006  014200                  MOV     $$STP(R0),      SP      ;INIALIZE THE STACK
027452  005060  014612                  CLR     PFFT(R0)                ;SPECIFY THE POWER FAIL
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2351  027456  012760  040630  014702          MOV     #CPUER, ERRTAB(R0)      ;SET FOR UNEXPECTED TRAPS TO 4
2352  027464  005702                          TST     R2                      ;DID WE TEST ALL THE BOXES
2353  027466  002012                          BGE     3$                      ;BRANCH IF NO
2354  027470  012737  000112  000110          MOV     #112,   @#110           ;RESTORE LOC 110
2355  027476  005037  000000                  CLR     @#0                     ;RESTORE LOC 0
2356  027502  012737  000001  014540          MOV     #1,     EXIT            ;SIGNAL THE SLAVES TO EXIT
2357  027510  000137  030120                  JMP     TST23                   ;GO TO THE NEXT TEST
2358  027514  005762  014502          3$:     TST     START(R2)               ;WHAT DO WE KNOW ABOUT THIS BOX?
2359  027520  003037                          BGT     10$                     ;BRANCH IF NOT THE BASE BOX
2360  027522  001403                          BEQ     4$                      ;BRANCH IF ITS THE BASE BOX
2361  027524  162702  000002                  SUB     #2,     R2              ;THERE WAS NO BOX-POINT TO THE NEXT LOWER BOX
2362  027530  000740                          BR      2$                      ;CONTINUE
2363  027532  022737  000001  014646  4$:     CMP     #1,     BOXNUM          ;WAS THERE ONLY ONE MEM BOX?
2364  027540  002027                          BGE     11$                     ;BRANCH IF YES
2365  027542  005737  014526                  TST     BOOT                    ;IS THIS THE DC TEST?
2366  027546  001141                          BNE     103$                    ;BRANCH IF YES
2367  027550  004737  033042                  JSR     PC,     RELOHI          ;TO TEST THE BASE BOX,
2368                                                                          ;RELOCATE THE PROGRAM FIRST TO THE NEXT HIGHER B
2369  027554  012737  000001  014532          MOV     #1,     HICORE          ;TURN MM ON ON POWER-UP
2370  027562  012737  000001  014534          MOV     #1,     RELOUP          ;SIGNAL SLAVES TO RELOCATE
2371  027570  063737  014550  172340          ADD     HIBOX,  KIPAR0          ;GET READY TO GO TO HIGH CORE
2372  027576  063737  014550  172342          ADD     HIBOX,  KIPAR1
2373  027604  063737  014550  172344          ADD     HIBOX,  KIPAR2
2374  027612  052737  000001  177572          BIS     #1,     MMR0            ;WE ARE NOW IN HIGH CORE
2375  027620                          10$:
2376  027620  005037  014530          11$:     CLR     PATCHK                  ;SET TO WRITE PATTERN
2377  027624  004737  032700                  JSR     PC,     PATTRN          ;WRITE THE PATTERN
2378  027630  004737  032566                  JSR     PC,     BUFCLR          ;CLEAR THE KEYBOARD BUFFER
2379  027634  104401  042534                  TYPE    ,TM106                  ;TELL THE OPERATOR TO POWER FAIL THE MEMORY BOX
2380  027640  006202                          ASR     R2
2381  027642  010246                          MOV     R2,     -(SP)
2382  027644  104405                          TYPDS
2383  027646  006302                          ASL     R2
2384  027650  104401  043226                  TYPE    ,TM108                  ;SPECIFY THE CONDITIONS
2385  027654  012703  030016                  MOV     #100$,  R3              ;SET UP THE POWER FAIL RETURN
2386  027660  005737  014526                  TST     BOOT                    ;IS THIS THE DC TEST?
2387  027664  001414                          BEQ     12$                     ;BRANCH IF NO
2388  027666  012737  020000  000000  13$:     MOV     #20000, @#0             ;MAKE BOOTING SLAVE SP=20000
2389  027674  005237  000110                  INC     @#110                   ;HANG THE SLAVES BOOT
2390  027700  105777  164304                  TSTB    @$TKS                   ;IS CHARACTER IN BUFFER?
2391  027704  100370                          BPL     13$                     ;LOOP
2392  027706  012777  033226  167120          MOV     #ENTR,  @ISTVEC         ;SET UP TO INTERRUPT SLAVES
2393  027714  000413                          BR      14$                     ;CONTINUE
2394  027716                          12$:
2395  027716  105777  164266                  TSTB    @$TKS                   ;IS CHARACTER IN THE BUFFER?
2396  027722  100375                          BPL     12$                     ;LOOP
2397  027724  005737  014522          17$:     TST     PWRFL                   ;SHOULD THE MASTER HAVE POWER FAILED?
2398  027730  001402                          BEQ     18$                     ;BRANCH IF NO
2399  027732  104024                          ERROR   24                      ;FAILURE TO POWER FAIL
2400  027734  000441                          BR      102$                    ;CONTINUE
2401  027736  104401  047252          18$:     TYPE    ,OK
2402  027742  000436                          BR      102$
2403  027744  017704  164210          14$:     MOV     @SWR,   R4              ;GET THE SWITCH VALUES
2404  027750  042704  177760                  BIC     #177760,        R4      ;SAVE ONLY CPU BITS
2405  027754  012777  000000  167046          MOV     #PGTE,  @ACR            ;ACCESS PGTE REG
2406  027762  010477  167044                  MOV     R4,     @ADR            ;SET INTERRUPT BITS
```

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2407  027766  032737  000001  016774          BIT     #BIT0,  CPUACT          ;EVEN OR ODD?
2408  027774  001404                          BEQ     15$                     ;BRANCH IF EVEN
2409  027776  012777  000001  167026          MOV     #1,     @ADR            ;INTERRUPTING AN EVEN NUMBER OF SLAVES
2410  030004  000422                          BR      103$                    ;
2411  030006  012777  000003  167016  15$:    MOV     #3,     @ADR            ;INTERRUPTING AN ODD # OF SLAVES
2412  030014  000416                          BR      103$
2413
2414  030016  005737  014522          100$:   TST     PWRFL                   ;DID WE EXPECT POWER FAIL?
2415  030022  001002                          BNE     101$                    ;BRANCH IF YES
2416  030024  104001                          ERROR   1                       ;MASTER ERROREOUSLY POWER FAILED
2417  030026  000404                          BR      102$                    ;CONTINUE
2418  030030  005060  017012          101$:   CLR     NOPRMP(R0)              ;ALLOW CPU IDENTIFICATION
2419  030034  104401  042052                  TYPE    ,TM103                  ;CPU POWER FAIL MSG
2420  030040  012737  000001  014530  102$:   MOV     #1,     PATCHK          ;SET UP FOR PATTERN CHECK
2421  030046  004737  032700                  JSR     PC,     PATTRN          ;CHECK THE PATTERN
2422  030052  032737  000001  177572  103$:   BIT     #1,     MMR0            ;ARE WE IN HIGH CORE?
2423  030060  001411                          BEQ     104$                    ;BRANCH IF NO
2424  030062  004737  033166                  JSR     PC,     RELOLO          ;ELSE RELOCATE
2425  030066  012737  000001  014536          MOV     #1,     RELODN          ;SIGNAL THE SLAVES
2426  030074  005037  177572                  CLR     MMR0                    ;WE ARE NOW BACK DOWN IN LOW CORE
2427  030100  005037  014532                  CLR     HICORE                  ;MAKE SURE MM ON POWER-UP DISABLED
2428  030104  005005                  104$:   CLR     R5                      ;MAKE TS22A DELAY
2429  030106  077501                          SOB     R5,
2430  030110  162702  000002                  SUB     #2,     R2              ;POINT TO NEXT BOX
2431  030114  000137  027432                  JMP     2$                      ;CONTINUE
2432
2433
2434
2435
2436
2437
2438
2439                                  ;;*********************************************************************
2440                                  ;*TEST 23       CHECK AC POWERFAIL ON MEM BOXES, PORTS ENABLED
2441                                  ;;*********************************************************************
2442  030120                          TST23:
2443  030120  012777  000023  164042          MOV     #23,@DISPLAY    ;SET TEST NUMBER
2444
2445  030126  112761  000023  014002          MOVB    #23,    $TSTNM(R1)      ;SET THE TEST NUMBER
2446  030134  106237  016776          2$:     ASRB    SYNC.3                  ;CONTROL THE ENTRY
2447  030140  103375                          BCC     2$
2448  030142  005237  014544                  INC     ENTR23                  ;INCREMENT ENTER FLAG
2449  030146  012737  000001  016776          MOV     #1,     SYNC.3          ;ALLOW THE OTHERS IN
2450  030154  023737  016774  014544  1$:     CMP     CPUACT, ENTR23          ;ARE ALL CPUS HERE?
2451  030162  001374                          BNE     1$                      ;NOT YET
2452  030164  005037  014540                  CLR     EXIT                    ;CLEAR THE EXIT FLAG
2453  030170  005037  177776                  CLR     PSW                     ;SET KERNAL MODE
2454  030174  020027  000000                  CMP     R0,     #0              ;IS THIS THE MASTER?
2455  030200  001001                          BNE     TS23B                   ;BRANCH IF NO
2456  030202  000474                          BR      TS23A                   ;THIS IS THE MASTER
2457
2458  030204  052777  100000  166616  TS23B:  BIS     #BIT15, @ACR            ;INITIALIZE THE IIST
2459  030212  012777  000023  163750          MOV     #23,    @DISPLAY        ;SET TEST NUMBER
2460  030220  016006  014200                  MOV     $$STP(R0),      SP      ;INITIALIZE THE STACK
2461  030224  005060  014612                  CLR     PFFT(R0)                ;SPECIFY THE POWER FAIL
2462  030230  012760  040630  014702          MOV     #CPUER, ERRTAB(R0)      ;SET FOR UNEXPECTED TRAPS TO 4
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2463  030236  012703  030350            MOV   #100$, R3            ;SET FOR POWER FAIL RETURN
2464  030242  005737  014540            TST   EXIT                  ;FINISHED WITH THIS TEST?
2465  030246  001404                    BEQ   1$                    ;BRANCH IF NO
2466  030250  005037  177572            CLR   MMR0                  ;MAKE SURE MM IS TURNED OFF
2467  030254  000137  031142            JMP   TST24                 ;GO TO NEXT TEST
2468  030260  005737  014534      1$:   TST   RELOUP                ;TIME TO RELOCATE?
2469  030264  001421                    BEQ   2$                    ;BRANCH IF NO
2470  030266  004737  032604            JSR   PC,     SETMM         ;GET READY FOR RELOCATION
2471  030272  063737  014550  172340    ADD   HIBOX,  KIPAR0
2472  030300  063737  014550  172342    ADD   HIBOX,  KIPAR1
2473  030306  063737  014550  172344    ADD   HIBOX,  KIPAR2
2474  030314  052737  000001  177572    BIS   #1,     MMR0          ;SLAVE IS NOW IN HIGH CORE
2475  030322  005037  014534            CLR   RELOUP                ;CLEAR RELOCATION FLAG
2476  030326  000726                    BR    TS23B                 ;CONTINUE TESTING
2477  030330  005737  014536      2$:   TST   RELODN                ;TIME TO RELOCATE?
2478  030334  001723                    BEQ   TS23B                 ;BRANCH IF NO
2479  030336  005037  177572            CLR   MMR0                  ;RETURN TO LOW CORE
2480  030342  005037  014536            CLR   RELODN                ;CLEAR THE FLAG
2481  030346  000716                    BR    TS23B                 ;CONTINUE
2482
2483  030350  005737  014522      100$: TST   PWRFL                 ;SHOULD WE BE HERE?
2484  030354  001002                    BNE   101$                  ;BRANCH IF YES
2485  030356  104001                    ERROR 1                     ;UNEXPECTED CPU POWER FAIL
2486  030360  000711                    BR    TS23B                 ;CONTINUE TESTING
2487  030362  005060  017012      101$: CLR   NOPRMP(R0)            ;WANT TO IDENTIFY THE CPU
2488  030366  104401  042052            TYPE  ,TM103                ;EXPECTED CPU POWER FAIL
2489  030372  000704                    BR    TS23B                 ;CONTINUE TESTING
2490
2491
2492
2493  030374                      TS23A:
2494  030374  005700                    TST   R0                    ;IS THIS THE MASTER?
2495  030376  001007                    BNE   5$                    ;BRANCH IF NO
2496  030400  104401  041713            TYPE  ,TM77                 ;"TEST"
2497  030404  005046                    CLR   -(SP)
2498  030406  116116  014002            MOVB  $TSTNM(R1),(SP) ;GET THE TEST NO.
2499  030412  104403                    TYPOS
2500  030414  000002                    .WORD 2                           ;TYPE 2 DIGITS, NO LEADING 0
2501  030416                      5$:
2502  030416  012737  000001  014522    MOV   #1,     PWRFL               ;SPECIFY WHETHER OR NOT TO EXPECT CPU POWER FAIL
2503  030424  012737  000000  014526    MOV   #0,     BOOT                ;SPECIFY WHETHER OR NOT TO EXPECT CPU BOOT AND I
2504  030432  004737  032342            JSR   PC,     MEMSIZ              ;FIND ALL THE MEM BOXES
2505  030436  005737  014540            TST   EXIT                        ;WAS ONLY ONE MEM BOX FOUND?
2506  030442  001402                    BEQ   1$                          ;BRANCH IF NO
2507  030444  000137  031142            JMP   TST24                       ;WE CAN'T DO THIS TEST
2508  030450  012702  000016      1$:   MOV   #16,    R2                  ;POINT TO BOX #7
2509  030454  052777  100000  166346  2$: BIS   #BIT15, @ACR               ;INITIALIZE THE IIST
2510  030462  012777  000023  163500    MOV   #23,    @DISPLAY            ;SET THE TEST NUMBER
2511  030470  016006  014200            MOV   $$STP(R0),      SP          ;INIALIZE THE STACK
2512  030474  005060  014612            CLR   PFFT(R0)                    ;SPECIFY THE POWER FAIL
2513  030500  012760  040630  014702    MOV   #CPUER, ERRTAB(R0)          ;SET FOR UNEXPECTED TRAPS TO 4
2514  030506  005702                    TST   R2                          ;DID WE TEST ALL THE BOXES
2515  030510  002012                    BGE   3$                          ;BRANCH IF NO
2516  030512  012737  000112  000110    MOV   #112,   @#110               ;RESTORE LOC 110
2517  030520  005037  000000            CLR   @#0                         ;RESTORE LOC 0
2518  030524  012737  000001  014540    MOV   #1,     EXIT                ;SIGNAL THE SLAVES TO EXIT
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2519  030532  000137  031142                JMP     TST24                   ;GO TO THE NEXT TEST
2520  030536  005762  014502          3$:   TST     START(R2)               ;WHAT DO WE KNOW ABOUT THIS BOX?
2521  030542  003037                        BGT     10$                     ;BRANCH IF NOT THE BASE BOX
2522  030544  001403                        BEQ     4$                      ;BRANCH IF ITS THE BASE BOX
2523  030546  162702  000002                SUB     #2,     R2              ;THERE WAS NO BOX-POINT TO THE NEXT LOWER BOX
2524  030552  000740                        BR      2$                      ;CONTINUE
2525  030554  022737  000001  014646  4$:   CMP     #1,     BOXNUM          ;WAS THERE ONLY ONE MEM BOX?
2526  030562  002027                        BGE     11$                     ;BRANCH IF YES
2527  030564  005737  014526                TST     BOOT                    ;IS THIS THE DC TEST?
2528  030570  001141                        BNE     103$                    ;BRANCH IF YES
2529  030572  004737  033042                JSR     PC,     RELOHI          ;TO TEST THE BASE BOX,
2530                                                                        ;RELOCATE THE PROGRAM FIRST TO THE NEXT HIGHER B
2531  030576  012737  000001  014532        MOV     #1,     HICORE          ;TURN MM ON ON POWER-UP
2532  030604  012737  000001  014534        MOV     #1,     RELOUP          ;SIGNAL SLAVES TO RELOCATE
2533  030612  063737  014550  172340        ADD     HIBOX,  KIPAR0          ;GET READY TO GO TO HIGH CORE
2534  030620  063737  014550  172342        ADD     HIBOX,  KIPAR1
2535  030626  063737  014550  172344        ADD     HIBOX,  KIPAR2
2536  030634  052737  000001  177572        BIS     #1,     MMR0            ;WE ARE NOW IN HIGH CORE
2537  030642                          10$:
2538  030642  005037  014530          11$:  CLR     PATCHK                  ;SET TO WRITE PATTERN
2539  030646  004737  032700                JSR     PC,     PATTRN          ;WRITE THE PATTERN
2540  030652  004737  032566                JSR     PC,     BUFCLR          ;CLEAR THE KEYBOARD BUFFER
2541  030656  104401  042534                TYPE    ,TM106                  ;TELL THE OPERATOR TO POWER FAIL THE MEMORY BOX
2542  030662  006202                        ASR     R2
2543  030664  010246                        MOV     R2,     -(SP)
2544  030666  104405                        TYPDS
2545  030670  006302                        ASL     R2
2546  030672  104401  042600                TYPE    ,TM107                  ;SPECIFY THE CONDITIONS
2547  030676  012703  031040                MOV     #100$,  R3              ;SET UP THE POWER FAIL RETURN
2548  030702  005737  014526                TST     BOOT                    ;IS THIS THE DC TEST?
2549  030706  001414                        BEQ     12$                     ;BRANCH IF NO
2550  030710  012737  020000  000000  13$:   MOV     #20000, @#0             ;MAKE BOOTING SLAVE SP=20000
2551  030716  005237  000110                INC     @#110                   ;HANG THE SLAVES BOOT
2552  030722  105777  163262                TSTB    @$TKS                   ;IS CHARACTER IN BUFFER?
2553  030726  100370                        BPL     13$                     ;LOOP
2554  030730  012777  033226  166076        MOV     #ENTR,  @ISTVEC         ;SET UP TO INTERRUPT SLAVES
2555  030736  000413                        BR      14$                     ;CONTINUE
2556  030740                          12$:
2557  030740  105777  163244                TSTB    @$TKS                   ;IS CHARACTER IN THE BUFFER?
2558  030744  100375                        BPL     12$                     ;LOOP
2559  030746  005737  014522          17$:  TST     PWRFL                   ;SHOULD THE MASTER HAVE POWER FAILED?
2560  030752  001402                        BEQ     18$                     ;BRANCH IF NO
2561  030754  104024                        ERROR   24                      ;FAILURE TO POWER FAIL
2562  030756  000441                        BR      102$                    ;CONTINUE
2563  030760  104401  047252          18$:  TYPE    ,OK
2564  030764  000436                        BR      102$
2565  030766  017704  163166          14$:  MOV     @SWR,   R4              ;GET THE SWITCH VALUES
2566  030772  042704  177760                BIC     #177760,        R4      ;SAVE ONLY CPU BITS
2567  030776  012777  000000  166024        MOV     #PGTE,  @ACR            ;ACCESS PGTE REG
2568  031004  010477  166022                MOV     R4,     @ADR            ;SET INTERRUPT BITS
2569  031010  032737  000001  016774        BIT     #BIT0,  CPUACT          ;EVEN OR ODD?
2570  031016  001404                        BEQ     15$                     ;BRANCH IF EVEN
2571  031020  012777  000001  166004        MOV     #1,     @ADR            ;INTERRUPTING AN EVEN NUMBER OF SLAVES
2572  031026  000422                        BR      103$                    ;
2573  031030  012777  000003  165774  15$:  MOV     #3,     @ADR            ;INTERRUPTING AN ODD # OF SLAVES
2574  031036  000416                        BR      103$
```

```
2575
2576  031040  005737  014522          100$:  TST     PWRFL                   ;DID WE EXPECT POWER FAIL?
2577  031044  001002                         BNE     101$                    ;BRANCH IF YES
2578  031046  104001                         ERROR   1                       ;MASTER ERROREOUSLY POWER FAILED
2579  031050  000404                         BR      102$                    ;CONTINUE
2580  031052  005060  017012          101$:  CLR     NOPRMP(R0)              ;ALLOW CPU IDENTIFICATION
2581  031056  104401  042052                 TYPE    ,TM103                  ;CPU POWER FAIL MSG
2582  031062  012737  000001  014530  102$:  MOV     #1,     PATCHK          ;SET UP FOR PATTERN CHECK
2583  031070  004737  032700                 JSR     PC,     PATTRN          ;CHECK THE PATTERN
2584  031074  032737  000001  177572  103$:  BIT     #1,     MMR0            ;ARE WE IN HIGH CORE?
2585  031102  001411                         BEQ     104$                    ;BRANCH IF NO
2586  031104  004737  033166                 JSR     PC,     RELOLO          ;ELSE RELOCATE
2587  031110  012737  000001  014536         MOV     #1,     RELODN          ;SIGNAL THE SLAVES
2588  031116  005037  177572                 CLR     MMR0                    ;WE ARE NOW BACK DOWN IN LOW CORE
2589  031122  005037  014532                 CLR     HICORE                  ;MAKE SURE MM ON POWER-UP DISABLED
2590  031126  005005          104$:  CLR     R5                      ;MAKE TS23A DELAY
2591  031130  077501                 SOB     R5,     .
2592  031132  162702  000002                 SUB     #2,     R2              ;POINT TO NEXT BOX
2593  031136  000137  030454                 JMP     2$                      ;CONTINUE
2594
2595
2596
2597
2598
2599
2600                          ;;*****************************************************************
2601                          ;*TEST 24       CHECK DC POWERFAIL ON MEM BOXES, CPUS BOOT ON POWER UP
2602                          ;;*****************************************************************
2603  031142                  TST24:
2604  031142  012777  000024  163020         MOV     #24,@DISPLAY    ;SET TEST NUMBER
2605
2606  031150  112761  000024  014002         MOVB    #24,    $TSTNM(R1)      ;SET THE TEST NUMBER
2607  031156  106237  016776          2$:    ASRB    SYNC.3                  ;CONTROL THE ENTRY
2608  031162  103375                         BCC     2$
2609  031164  005237  014546                 INC     ENTR24                  ;INCREMENT ENTER FLAG
2610  031170  012737  000001  016776         MOV     #1,     SYNC.3          ;ALLOW THE OTHERS IN
2611  031176  023737  016774  014546  1$:    CMP     CPUACT, ENTR24          ;ARE ALL CPUS HERE?
2612  031204  001374                         BNE     1$                      ;NOT YET
2613  031206  005037  014540                 CLR     EXIT                    ;CLEAR THE EXIT FLAG
2614  031212  005037  177776                 CLR     PSW                     ;SET KERNAL MODE
2615  031216  020027  000000                 CMP     R0,     #0              ;IS THIS THE MASTER?
2616  031222  001001                         BNE     TS24B                   ;BRANCH IF NO
2617  031224  000474                         BR      TS24A                   ;THIS IS THE MASTER
2618
2619  031226  052777  100000  165574  TS24B: BIS     #BIT15, @ACR            ;INITIALIZE THE IIST
2620  031234  012777  000024  162726         MOV     #24,    @DISPLAY        ;SET TEST NUMBER
2621  031242  016006  014200                 MOV     $$STP(R0),      SP      ;INITIALIZE THE STACK
2622  031246  005060  014612                 CLR     PFFT(R0)                ;SPECIFY THE POWER FAIL
2623  031252  012760  040630  014702         MOV     #CPUER, ERRTAB(R0)      ;SET FOR UNEXPECTED TRAPS TO 4
2624  031260  012703  031372                 MOV     #100$,  R3              ;SET FOR POWER FAIL RETURN
2625  031264  005737  014540                 TST     EXIT                    ;FINISHED WITH THIS TEST?
2626  031270  001404                         BEQ     1$                      ;BRANCH IF NO
2627  031272  005037  177572                 CLR     MMR0                    ;MAKE SURE MM IS TURNED OFF
2628  031276  000137  032164                 JMP     TST25                   ;GO TO NEXT TEST
2629  031302  005737  014534          1$:    TST     RELOUP                  ;TIME TO RELOCATE?
2630  031306  001421                         BEQ     2$                      ;BRANCH IF NO
```

```
                                                JSR     PC,     SETMM           ;GET READY FOR RELOCATION
                                                ADD     HIBOX,  KIPAR0
                                                ADD     HIBOX,  KIPAR1
                                                ADD     HIBOX,  KIPAR2
                                                BIS     #1,     MMR0            ;SLAVE IS NOW IN HIGH CORE
                                                CLR     RELOUP                  ;CLEAR RELOCATION FLAG
                                                BR      TS24B                   ;CONTINUE TESTING
                                        2$:     TST     RELODN                  ;TIME TO RELOCATE?
                                                BEQ     TS24B                   ;BRANCH IF NO
                                                CLR     MMR0                    ;RETURN TO LOW CORE
                                                CLR     RELODN                  ;CLEAR THE FLAG
                                                BR      TS24B                   ;CONTINUE

                                        100$:   TST     PWRFL                   ;SHOULD WE BE HERE?
                                                BNE     101$                    ;BRANCH IF YES
                                                ERROR   1                       ;UNEXPECTED CPU POWER FAIL
                                                BR      TS24B                   ;CONTINUE TESTING
                                        101$:   CLR     NOPRMP(R0)              ;WANT TO IDENTIFY THE CPU
                                                TYPE    ,TM103                  ;EXPECTED CPU POWER FAIL
                                                BR      TS24B                   ;CONTINUE TESTING


                                        TS24A:
                                                TST     R0                      ;IS THIS THE MASTER?
                                                BNE     5$                      ;BRANCH IF NO
                                                TYPE    ,TM77                   ;'TEST'
                                                CLR     -(SP)
                                                MOVB    $TSTNM(R1),(SP) ;GET THE TEST NO.
                                                TYPOS
                                                .WORD   2                       ;TYPE 2 DIGITS, NO LEADING 0
                                        5$:
                                                MOV     #0,     PWRFL           ;SPECIFY WHETHER OR NOT TO EXPECT CPU POWER FAIL
                                                MOV     #1,     BOOT            ;SPECIFY WHETHER OR NOT TO EXPECT CPU BOOT AND I
                                                JSR     PC,     MEMSIZ          ;FIND ALL THE MEM BOXES
                                                TST     EXIT                    ;WAS ONLY ONE MEM BOX FOUND?
                                                BEQ     1$                      ;BRANCH IF NO
                                                JMP     TST25                   ;WE CAN'T DO THIS TEST
                                        1$:     MOV     #16,    R2              ;POINT TO BOX #7
                                        2$:     BIS     #BIT15, @ACR            ;INITIALIZE THE IIST
                                                MOV     #24,    @DISPLAY        ;SET THE TEST NUMBER
                                                MOV     $$STP(R0),      SP      ;INIALIZE THE STACK
                                                CLR     PFFT(R0)                ;SPECIFY THE POWER FAIL
                                                MOV     #CPUER, ERRTAB(R0)      ;SET FOR UNEXPECTED TRAPS TO 4
                                                TST     R2                      ;DID WE TEST ALL THE BOXES
                                                BGE     3$                      ;BRANCH IF NO
                                                MOV     #112,   @#110           ;RESTORE LOC 110
                                                CLR     @#0                     ;RESTORE LOC 0
                                                MOV     #1,     EXIT            ;SIGNAL THE SLAVES TO EXIT
                                                JMP     TST25                   ;GO TO THE NEXT TEST
                                        3$:     TST     START(R2)               ;WHAT DO WE KNOW ABOUT THIS BOX?
                                                BGT     10$                     ;BRANCH IF NOT THE BASE BOX
                                                BEQ     4$                      ;BRANCH IF ITS THE BASE BOX
                                                SUB     #2,     R2              ;THERE WAS NO BOX-POINT TO THE NEXT LOWER BOX
                                                BR      2$                      ;CONTINUE
                                        4$:     CMP     #1,     BOXNUM          ;WAS THERE ONLY ONE MEM BOX?
```

```
2687  031604  002027                        BGE     11$                     ;BRANCH IF YES
2688  031606  005737  014526                TST     BOOT                    ;IS THIS THE DC TEST?
2689  031612  001141                        BNE     103$                    ;BRANCH IF YES
2690  031614  004737  033042                JSR     PC,     RELOHI          ;TO TEST THE BASE BOX,
2691                                                                        ;RELOCATE THE PROGRAM FIRST TO THE NEXT HIGHER B
2692  031620  012737  000001  014532        MOV     #1,     HICORE          ;TURN MM ON ON POWER-UP
2693  031626  012737  000001  014534        MOV     #1,     RELOUP          ;SIGNAL SLAVES TO RELOCATE
2694  031634  063737  014550  172340        ADD     HIBOX,  KIPAR0          ;GET READY TO GO TO HIGH CORE
2695  031642  063737  014550  172342        ADD     HIBOX,  KIPAR1
2696  031650  063737  014550  172344        ADD     HIBOX,  KIPAR2
2697  031656  052737  000001  177572        BIS     #1,     MMR0            ;WE ARE NOW IN HIGH CORE
2698  031664                        10$:
2699  031664  005037  014530        11$:    CLR     PATCHK                  ;SET TO WRITE PATTERN
2700  031670  004737  032700                JSR     PC,     PATTRN          ;WRITE THE PATTERN
2701  031674  004737  032566                JSR     PC,     BUFCLR          ;CLEAR THE KEYBOARD BUFFER
2702  031700  104401  042534                TYPE    ,TM106                  ;TELL THE OPERATOR TO POWER FAIL THE MEMORY BOX
2703  031704  006202                        ASR     R2
2704  031706  010246                        MOV     R2,     -(SP)
2705  031710  104405                        TYPDS
2706  031712  006302                        ASL     R2
2707  031714  104401  044270                TYPE    ,TM110                  ;SPECIFY THE CONDITIONS
2708  031720  012703  032062                MOV     #100$,  R3              ;SET UP THE POWER FAIL RETURN
2709  031724  005737  014526                TST     BOOT                    ;IS THIS THE DC TEST?
2710  031730  001414                        BEQ     12$                     ;BRANCH IF NO
2711  031732  012737  020000  000000  13$:  MOV     #20000, @#0             ;MAKE BOOTING SLAVE SP=20000
2712  031740  005237  000110                INC     @#110                   ;HANG THE SLAVES BOOT
2713  031744  105777  162240                TSTB    @$TKS                   ;IS CHARACTER IN BUFFER?
2714  031750  100370                        BPL     13$                     ;LOOP
2715  031752  012777  033226  165054        MOV     #ENTR,  @ISTVEC         ;SET UP TO INTERRUPT SLAVES
2716  031760  000413                        BR      14$                     ;CONTINUE
2717  031762                        12$:
2718  031762  105777  162222                TSTB    @$TKS                   ;IS CHARACTER IN THE BUFFER?
2719  031766  100375                        BPL     12$                     ;LOOP
2720  031770  005737  014522        17$:    TST     PWRFL                   ;SHOULD THE MASTER HAVE POWER FAILED?
2721  031774  001402                        BEQ     18$                     ;BRANCH IF NO
2722  031776  104024                        ERROR   24                      ;FAILURE TO POWER FAIL
2723  032000  000441                        BR      102$                    ;CONTINUE
2724  032002  104401  047252        18$:    TYPE    ,OK
2725  032006  000436                        BR      102$
2726  032010  017704  162144        14$:    MOV     @SWR,   R4              ;GET THE SWITCH VALUES
2727  032014  042704  177760                BIC     #177760,        R4      ;SAVE ONLY CPU BITS
2728  032020  012777  000000  165002        MOV     #PGTE,  @ACR            ;ACCESS PGTE REG
2729  032026  010477  165000                MOV     R4,     @ADR            ;SET INTERRUPT BITS
2730  032032  032737  000001  016774        BIT     #BIT0,  CPUACT          ;EVEN OR ODD?
2731  032040  001404                        BEQ     15$                     ;BRANCH IF EVEN
2732  032042  012777  000001  164762        MOV     #1,     @ADR            ;INTERRUPTING AN EVEN NUMBER OF SLAVES
2733  032050  000422                        BR      103$                    ;
2734  032052  012777  000003  164752  15$:  MOV     #3,     @ADR            ;INTERRUPTING AN ODD # OF SLAVES
2735  032060  000416                        BR      103$
2736
2737  032062  005737  014522        100$:   TST     PWRFL                   ;DID WE EXPECT POWER FAIL?
2738  032066  001002                        BNE     101$                    ;BRANCH IF YES
2739  032070  104001                        ERROR   1                       ;MASTER ERROREOUSLY POWER FAILED
2740  032072  000404                        BR      102$                    ;CONTINUE
2741  032074  005060  017012        101$:   CLR     NOPRMP(R0)              ;ALLOW CPU IDENTIFICATION
2742  032100  104401  042052                TYPE    ,TM103                  ;CPU POWER FAIL MSG
```

```
032104  012737  000001  014530  102$:   MOV     #1,     PATCHK          ;SET UP FOR PATTERN CHECK
032112  004737  032700                  JSR     PC,     PATTRN          ;CHECK THE PATTERN
032116  032737  000001  177572  103$:   BIT     #1,     MMR0            ;ARE WE IN HIGH CORE?
032124  001411                          BEQ     104$                    ;BRANCH IF NO
032126  004737  033166                  JSR     PC,     RELOLO          ;ELSE RELOCATE
032132  012737  000001  014536          MOV     #1,     RELODN          ;SIGNAL THE SLAVES
032140  005037  177572                  CLR     MMR0                    ;WE ARE NOW BACK DOWN IN LOW CORE
032144  005037  014532                  CLR     HICORE                  ;MAKE SURE MM ON POWER-UP DISABLED
032150  005005                  104$:   CLR     R5                      ;MAKE TS24A DELAY
032152  077501                          SOB     R5,     .
032154  162702  000002                  SUB     #2,     R2              ;POINT TO NEXT BOX
032160  000137  031476                  JMP     2$                      ;CONTINUE







                                ;;*******************************************************************
                                ;*TEST 25        CHECK SYSTEM RECOVERY ON AC POWER FAIL
                                ;;*******************************************************************
032164                          TST25:
032164  012777  000025  161776          MOV     #25,@DISPLAY    ;SET TEST NUMBER
032172  112761  000025  014002          MOVB    #25,    $TSTNM(R1)      ;SET THE TEST NUMBER
032200  032770  000400  014160          BIT     #SW08,  @SWR(R0)        ;SKIP THIS TEST?
032206  001002                          BNE     1$                      ;BRANCH IF NO
032210  000137  035326                  JMP     $EOP            ;ELSE GO TO EOP
032214                          1$:
032214  020027  000000                  CMP     R0,#0           ;SWITCH THIS PROCESSOR?
032220  001002                          BNE     64$             ;BRANCH IF NO
032222  000137  032232                  JMP     TS25A           ;YES, SWITCH TO A.
032226  000137  032264          64$:    JMP     TS25B           ;NO, SWITCH TO B.
032232                          TS25A:
032232  005700                          TST     R0              ;IS THIS THE MASTER?
032234  001007                          BNE     5$              ;BRANCH IF NO
032236  104401  041713                  TYPE    ,TM77           ;"TEST"
032242  005046                          CLR     -(SP)
032244  116116  014002                  MOVB    $TSTNM(R1),(SP) ;GET THE TEST NO.
032250  104403                          TYPOS
032252  000002                          .WORD   2                       ;TYPE 2 DIGITS, NO LEADING 0
032254                          5$:
032254  104401  014333                  TYPE    ,$CRLF
032260  104401  042115                  TYPE    ,TM104          ;"POWER FAIL ENTIRE SYSTEM"
032264  012760  004000  014612  TS25B:  MOV     #TI,    PFFT(R0)
032272  005003                          CLR     R3
032274  005037  014714                  CLR     SYNC.2
032300  000001                          WAIT                            ;WAIT FOR POWER TO FAIL
032302  106237  016776          3$:     ASRB    SYNC.3                  ;CONTROL THE CPUS
032306  103375                          BCC     3$
032310  005237  014714                  INC     SYNC.2                  ;COUNT THE CPUS
032314  012737  000001  016776          MOV     #1,     SYNC.3          ;ALLOW ANOTHER IN
032322  023737  016774  014714  1$:     CMP     CPUACT, SYNC.2
032330  001374                          BNE     1$
032332  104401  014220                  TYPE    ,$NULL
032336  000137  035326                  JMP     $EOP                    ;GO TO END OF PASS
```

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2799
2800                                            .SBTTL  MEMORY BOX TEST ROUTINES
2801  032342  005002                    MEMSIZ: CLR     R2                      ;GET SET TO FILL THE START AND STOP TABLES
2802  032344  012704  172100                    MOV     #172100,        R4      ;POINT TO THE FIRST CSR
2803  032350  005037  014646                    CLR     BOXNUM                  ;START WITH 0 BOXES
2804  032354                            1$:
2805  032354  012760  032476  014702            MOV     #100$,  ERRTAB(R0)      ;SET UP FOR NO BOX
2806  032362  052714  000010                    BIS     #10,    (R4)            ;SET UP TO GET BOX CAPACITY
2807  032366  012462  014462                    MOV     (R4)+,  STOP(R2)
2808  032372  000362  014462                    SWAB    STOP(R2)
2809  032376  042762  177600  014462            BIC     #177600,        STOP(R2);NOW WE HAVE IT
2810  032404  012462  014502                    MOV     (R4)+,  START(R2)       ;NOW GET THE STARTING ADR.
2811  032410  042762  177000  014502            BIC     #177000,        START(R2)
2812  032416  016205  014502                    MOV     START(R2),      R5      ;MAKE IT LOOK LIKE A PAR
2813  032422  072527  000012                    ASH     #10.,   R5
2814  032426  010562  014502                    MOV     R5,     START(R2)
2815  032432  016205  014462                    MOV     STOP(R2),       R5      ;DO THE SAME FOR STOP
2816  032436  072527  000012                    ASH     #10.,   R5
2817  032442  010562  014462                    MOV     R5,     STOP(R2)
2818  032446  066262  014502  014462            ADD     START(R2),      STOP(R2);STOP=START+CAPACITY
2819  032454  005237  014646                    INC     BOXNUM                  ;INCREMENT BOX COUNT
2820  032460  005762  014502                    TST     START(R2)               ;IS THIS THE BASE BOX?
2821  032464  001413                            BEQ     101$                    ;BRANCH IF YES
2822  032466  016237  014502  014550            MOV     START(R2),      HIBOX   ;GET A BOX TO RELOCATE TO
2823  032474  000407                            BR      101$
2824  032476  012762  177777  014502  100$:     MOV     #-1,    START(R2)       ;INDICATE NON-EXISTENT BOX
2825  032504  062706  000004                    ADD     #4,     SP              ;RESTORE THE STACK
2826  032510  062704  000004                    ADD     #4,     R4              ;POINT TO NEXT CSR PAIR
2827  032514  062702  000002            101$:   ADD     #2,     R2              ;POINT TO NEXT TABLE LOCATIONS
2828  032520  022702  000020                    CMP     #20,    R2              ;HAVE WE LOOKED FOR EIGHT BOXES?
2829  032524  003313                            BGT     1$                      ;BRANCH IF NO
2830  032526  012760  040630  014702            MOV     #CPUER, ERRTAB(R0)      ;RESET TRAP TO 4 POINTER
2831  032534  022737  000001  014646            CMP     #1,     BOXNUM          ;WAS THERE MORE THAN A SINGLE BOX?
2832  032542  002410                            BLT     102$                    ;BRANCH IF YES
2833  032544  005737  014522                    TST     PWRFL                   ;IS THIS TEST 23?
2834  032550  001005                            BNE     102$                    ;BRANCH IF YES
2835  032552  104401  044206                    TYPE    ,TM109                  ;PRINT ONLY ONE BOX MSG
2836  032556  012737  000001  014540            MOV     #1,     EXIT            ;SIGNAL TO EXIT
2837
2838  032564  000207                    102$:   RTS     PC                      ;RETURN
2839
2840  032566  105777  161416            BUFCLR: TSTB    @$TKS                   ;IS THE BUFFER EMPTY?
2841  032572  100003                            BPL     1$                      ;BRANCH IF YES
2842  032574  117705  161412                    MOVB    @$TKB,  R5              ;FLUSH IT
2843  032600  000772                            BR      BUFCLR                  ;LOOP
2844  032602  000207                    1$:     RTS     PC                      ;RETURN
2845
2846  032604  005037  172340            SETMM:  CLR     KIPAR0                  ;SET UP PARS 0,1,2,7
2847  032610  012737  077406  172300            MOV     #77406, KIPDR0
2848  032616  012737  000200  172342            MOV     #200,   KIPAR1
2849  032624  012737  077406  172302            MOV     #77406, KIPDR1
2850  032632  012737  000400  172344            MOV     #400,   KIPAR2
2851  032640  012737  077406  172304            MOV     #77406, KIPDR2
2852  032646  012737  177600  172356            MOV     #177600,        KIPAR7
2853  032654  012737  077406  172316            MOV     #77406, KIPDR7
2854  032662  012737  000020  172516            MOV     #20,    MMR3
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2855  032670  012737  033534  000250          MOV     #MMERR, MMVEC
2856  032676  000207                          RTS     PC
2857
2858  032700  005737  014526          PATTRN: TST     BOOT                    ;ARE WE DOING THE DC TEST?
2859  032704  001055                          BNE     7$                      ;BRANCH IF YES
2860  032706  005762  014502                  TST     START(R2)               ;ARE WE DOING THE BASE BOX?
2861  032712  001452                          BEQ     7$                      ;BRANCH IF YES
2862  032714  004737  032604                  JSR     PC,     SETMM           ;SET UP PARS 0,1,2,7
2863  032720  016237  014502  172346          MOV     START(R2),      KIPAR3  ;USE PAR3 TO WRITE PATTRN
2864  032726  012737  077406  172306          MOV     #77406, KIPDR3
2865  032734  012760  040630  014702          MOV     #CPUER, ERRTAB(R0)      ;SET UP FOR UNEXPECTED TRAPS
2866  032742  052737  000001  177572          BIS     #1,     MMR0            ;TURN ON MM
2867  032750  012705  060000          1$:     MOV     #60000, R5              ;POINT TO PAR3 SPACE
2868  032754  026237  014462  172346          CMP     STOP(R2),       KIPAR3  ;IS THIS THE END OF THE BOX?
2869  032762  003424                          BLE     6$                      ;BRANCH IF YES
2870  032764  005737  014530          2$:     TST     PATCHK                  ;ARE WE WRITING A PATTERN?
2871  032770  001002                          BNE     3$                      ;BRANCH IF ONLY READING IT
2872  032772  012715  152525                  MOV     #152525,        (R5)    ;WRITE THE PATTERN
2873  032776  022725  152525          3$:     CMP     #152525,        (R5)+   ;IS THE PATTERN CORRECT?
2874  033002  001405                          BEQ     4$                      ;BRANCH IF YES
2875  033004  013760  172346  014250          MOV     KIPAR3, $REG1(R0)       ;SAVE THE BAD ADDRESS (PAR)
2876  033012  104013                          ERROR   13                      ;MEMORY IS CORRUPTED
2877  033014  000407                          BR      6$                      ;REPORT ONLY ONE ERROR
2878  033016  022705  100000          4$:     CMP     #100000,        R5      ;ARE WE STILL IN PAR3 SPACE?
2879  033022  003360                          BGT     2$                      ;BRANCH IF YES
2880  033024  062737  000200  172346          ADD     #200,   KIPAR3          ;ELSE RESET THE PAR
2881  033032  000746                          BR      1$                      ;AND CONTINUE
2882  033034                          6$:
2883  033034  005037  177572                  CLR     MMR0                    ;END MM
2884  033040  000207                  7$:     RTS     PC                      ;RETURN
2885
2886  033042  004737  032604          RELOHI: JSR     PC,     SETMM           ;SET UP PARS 0,1,2,7
2887  033046  012760  040630  014702          MOV     #CPUER, ERRTAB(R0)      ;SET UP FOR TRAP TO 4
2888  033054  013737  014550  172346          MOV     HIBOX,  KIPAR3          ;PARS 3,4,5 WILL TAKE US TO HIGH CORE
2889  033062  012737  077406  172306          MOV     #77406, KIPDR3
2890  033070  013737  014550  172350          MOV     HIBOX,  KIPAR4
2891  033076  062737  000200  172350          ADD     #200,   KIPAR4
2892  033104  012737  077406  172310          MOV     #77406, KIPDR4
2893  033112  013737  014550  172352          MOV     HIBOX,  KIPAR5
2894  033120  062737  000400  172352          ADD     #400,   KIPAR5
2895  033126  012737  077406  172312          MOV     #77406, KIPDR5
2896  033134  012704  060000                  MOV     #60000, R4              ;POINT TO PAR3
2897  033140  005005                          CLR     R5                      ;POINT TO PAR0
2898  033142  052737  000001  177572          BIS     #1,     MMR0            ;TURN ON MM
2899  033150  012524                  1$:     MOV     (R5)+,  (R4)+           ;RELOCATE THE PROGRAM
2900  033152  022705  060000                  CMP     #60000, R5              ;ARE WE FINISHED?
2901  033156  003374                          BGT     1$                      ;BRANCH IF NO
2902  033160  005037  177572                  CLR     MMR0                    ;TURN OFF MM
2903  033164  000207                          RTS     PC
2904
2905  033166  005037  172346          RELOLO: CLR     KIPAR3                  ;USE PARS 3,4,5 TO RESTORE CODE TO LOW CORE
2906  033172  012737  000200  172350          MOV     #200,   KIPAR4
2907  033200  012737  000400  172352          MOV     #400,   KIPAR5
2908  033206  012704  060000                  MOV     #60000, R4              ;POINT TO PAR 3
2909  033212  005005                          CLR     R5                      ;POINT TO PAR 0
2910  033214  012524                  1$:     MOV     (R5)+,  (R4)+           ;RESTORE THE PROGRAM
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2911  033216  022705  060000              CMP     #60000, R5              ;ARE WE FINISHED?
2912  033222  003374                      BGT     1$                      ;BRANCH IF NO
2913  033224  000207                      RTS     PC                      ;RETURN-STILL EXECUTING IN HIGH CORE
2914
2915  033226  052737  001000  177746  ENTR:   BIS     #BIT9,  CONTRL  ;TURN OFF CACHE
2916  033234  017705  163570                  MOV     @ACR,   R5              ;GET CPU ID
2917  033240  072527  177770                  ASH     #-10,   R5
2918  033244  005004                          CLR     R4                      ;SET UP R0
2919  033246  026405  014226          65$:    CMP     $CPUID(R4),     R5
2920  033252  001404                          BEQ     64$
2921  033254  005724                          TST     (R4)+
2922  033256  020427  000010                  CMP     R4,     #10
2923  033262  002771                          BLT     65$
2924  033264  010400                  64$:    MOV     R4,     R0
2925  033266  010001                          MOV     R0,     R1              ;SET UP R1
2926  033270  006201                          ASR     R1
2927  033272  052777  100000  163530          BIS     #BIT15, @ACR            ;INITIALIZE THE IIST
2928  033300  016006  014200                  MOV     $$STP(R0),      SP      ;SET UP THE STACK
2929  033304  012760  034656  014662          MOV     #$PWRDN,        PWRTAB(R0);SET UP FOR POWER DOWN
2930  033312  020027  000000                  CMP     R0,     #0              ;SHOULD WE BE HERE?
2931  033316  001406                          BEQ     1$                      ;BRANCH IF NO
2932  033320  005060  017012                  CLR     NOPRMP(R0)
2933  033324  104401  045163                  TYPE    ,TM111
2934  033330  000137  031226                  JMP     TS24B                   ;RETURN SLAVES
2935  033334  104025                  1$:     ERROR   25                      ;UNEXPECTED INTERRUPT
2936  033336  000000                          HALT                            ;HALT THE MASTER
2937
2938
2939
2940
2941                                  .SBTTL  PARITY ERROR HANDLER
2942
2943  033340  005327                  PARERR: DEC     (PC)+           ;FIRST TIME IN?
2944  033342  000001                  PARFLG: .WORD   1
2945  033344  002001                          BGE     1$                      ;BRANCH IS YES
2946  033346  000000                          HALT                            ;ELSE HALT
2947  033350  013760  177766  014250  1$:     MOV     CPUERR, $REG1(R0)
2948  033356  013760  177744  014260          MOV     MEMERR, $REG2(R0)
2949  033364  104007                          ERROR   7                       ;UNEXPECTED TRAP TO 114
2950  033366  000000                          HALT
2951  033370  013737  177744  177744          MOV     @#MEMERR,@#MEMERR ;CLEAR ERROR INDICATORS
2952  033376  012737  000001  033342          MOV     #1,PARFLG       ;INITIALIZE PARITY ERROR FLAG
2953  033404  000002                          RTI                     ;CONTINUE TESTING
2954                                  .SBTTL  SETUP MEMORY MANAGMENT REGISTERS
2955
2956  033406  012737  000000  172340  MAP:    MOV     #0,@#KIPAR0     ;SETUP PAR0 FOR 1ST 4K
2957  033414  012737  077406  172300          MOV     #77406,@#KIPDR0 ;4K, R/W, EXPAND UP
2958  033422  012737  000200  172342          MOV     #200,@#KIPAR1   ;SETUP PAR0 FOR 2ND 4K
2959  033430  012737  077406  172302          MOV     #77406,@#KIPDR1 ;4K,R/W,EXPAND UP
2960  033436  012737  000400  172344          MOV     #400,@#KIPAR2   ;SETUP PAR2 FOR NEXT 4K
2961  033444  012737  077406  172304          MOV     #77406,@#KIPDR2 ;4K,R/W,EXPAND UP
2962  033452  012737  000000  172352          MOV     #0,@#KIPAR5     ;SET UP PAR5 FOR 1ST 4K
2963  033460  012737  077406  172312          MOV     #77406,@#KIPDR5 ;4K, R/W, ED=UP
2964  033466  012737  000200  172354          MOV     #200,@#KIPAR6   ;SET UP PAR6 FOR 2ND 4K
2965  033474  012737  000000  172314          MOV     #0,@#KIPDR6     ;ABORT ALL REFERENCES
2966  033502  012737  177600  172356          MOV     #177600,@#KIPAR7  ;SET UP PAR7 FOR I/O PAGE
```

```
2967  033510  012737  077406  172316          MOV     #77406,@#KIPDR7 ;4K, R/W, ED=UP
2968  033516  012737  000020  172516          MOV     #BIT04,@#MMR3   ;SET UP FOR 22-BIT MAPPING
2969  033524  012737  033534  000250          MOV     #MMERR,@#MMVEC  ;SET UP MEMORY MANAGEMENT VECTOR
2970  033532  000207                          RTS     PC              ;RETURN FROM CALL
2971  033534  000000                  MMERR:  HALT                    ;MEMORY MANAGEMENT ERROR
2972  033536  000776                          BR      MMERR
2973
2974                                          .SBTTL  MASSBUS TRANSFER ROUTINES
2975  033540                          MBUSR:
2976  033540  032737  000200  176700  4$:     BIT     #BIT7,  @#RPCS1         ;WAIT FOR CONTROLLER READY
2977  033546  001774                          BEQ     4$
2978  033550  156037  014632  176710          BISB    MBDSW(R0),      @#RPCS2 ;GET THE DRIVE #
2979  033556  012737  174000  176702          MOV     #-4000,@#RPWC           ;;SET WORD COUNT
2980  033564  010437  176704                  MOV     R4,@#RPBA               ;;SET MEMORY ADDRESS
2981  033570  005037  176706                  CLR     @#RPDA                  ;;READ SECTOR 0
2982  033574  032737  000200  176712  3$:     BIT     #BIT7,  @#RPDS          ;WAIT FOR DRIVE READY
2983  033602  001774                          BEQ     3$
2984  033604  052737  000001  176700          BIS     #BIT0,@#RPCS1           ;;
2985  033612  106237  033534          1$:     ASRB    MMERR                   ;;DO ASRB DURING TRANSFER
2986  033616  106237  033534                  ASRB    MMERR
2987  033622  106237  033534                  ASRB    MMERR
2988  033626  106237  033534                  ASRB    MMERR
2989  033632  106237  033534                  ASRB    MMERR
2990  033636  106237  033534                  ASRB    MMERR
2991  033642  106237  033534                  ASRB    MMERR
2992  033646  106237  033534                  ASRB    MMERR
2993  033652  106237  033534                  ASRB    MMERR
2994  033656  106237  033534                  ASRB    MMERR
2995  033662  032737  000200  176712          BIT     #BIT7,@#RPDS            ;;DEVICE READY?
2996  033670  001750                          BEQ     1$                      ;;BRANCH IF NO.
2997  033672  005737  176700                  TST     @#RPCS1                 ;;ANY ERRORS?
2998  033676  100001                          BPL     2$                      ;;NO
2999  033700  000000                          HALT                            ;;YES
3000  033702  000207                  2$:     RTS     PC                      ;;RETURN
3001                                          .SBTTL  LINE CLOCK ROUTINE
3002  033704  012737  033724  000100  SETCLK: MOV     #5$,@#100               ;;SET THE INTERRUPT VECTOR FOR CLK
3003  033712  005204                          INC     R4                      ;;ADD 1 TO THE ARGUMENT PASSED
3004  033714  012737  000100  177546          MOV     #BIT6,@#LKS             ;;START THE CLOCK
3005  033722  000207                          RTS     PC                      ;;RETURN
3006  033724  052737  000340  177776  5$:     BIS     #340,@#PS               ;;HIGH PRIORITY
3007  033732  042737  000200  177546          BIC     #BIT7,@#LKS             ;;CLEAR THE MONITOR BIT
3008  033740  005304                          DEC     R4                      ;;ONE TICK
3009  033742  005704                          TST     R4                      ;;COUNT TO ZERO?
3010  033744  001010                          BNE     6$                      ;;NO DON'T STOP THE CLOCK
3011  033746  005037  177546                  CLR     @#LKS                   ;;TURN IT OFF
3012  033752  000240                          NOP
3013  033754  000240                          NOP
3014  033756  000240                          NOP
3015  033760  000240                          NOP
3016  033762  062716  000004                  ADD     #4,(SP)                 ;;SKIP RETURN
3017  033766  162716  000002          6$:     SUB     #2,(SP)                 ;;IF COUNT ISN'T EXPIRED...
3018  033772  000002                  7$:     RTI                             ;;RETURN TO THE WAIT
3019
3020
3021
3022
```

```
                                .SBTTL  POWER FAIL ROUTINE (SECTION 1)

033774  012737  034436  014662  POWDWN: MOV     #ILLUP,PWRTAB   ;IF TOO FAST WITH POWER UP
034002  105737  016740                  TSTB    UBEF            ;;USE UNIBUS EXERCISER?
034006  001403                        BEQ     64$
034010  042737  000020  170016        BIC     #BIT4,@#UBCR2   ;;CLEAR POWER FAIL ENABLE
034016                          64$:
034016  022706  000440                CMP     #440,SP         ;YELLOW OR RED?
034022  100402                        BMI     1$              ;NO
034024  016006  014200                MOV     $$STP(R0),SP    ;SET EMERGENCY STACK
034030  010246                  1$:   MOV     R2,-(SP)                ;SAVE R2
034032  012702  177572                MOV     #MMR0,R2                ;SAVE PSW THRU MMR0
034036  012246                  10$:  MOV     (R2)+,-(SP)
034040  022702  177676                CMP     #UDPAR7,R2
034044  103374                        BHIS    10$
034046  013746  177776                MOV     @#PSW,-(SP)     ;SAVE PSW
034052  013746  177746                MOV     @#CONTRL,-(SP)  ;SAVE CACHE CONTROL
034056  013746  172516                MOV     @#MMR3,-(SP)            ;SAVE MMR3
034062  012702  172200                MOV     #SIPDR0,R2              ;SAVE SIPDR0 THRU KDPAR7
034066  012246                  20$:  MOV     (R2)+,-(SP)
034070  022702  172376                CMP     #KDPAR7,R2
034074  103374                        BHIS    20$
034076  012702  170200                MOV     #MAPL00,R2              ;SAVE THE UNIBUS MAP
034102  012246                  30$:  MOV     (R2)+,-(SP)
034104  022702  170376                CMP     #MAPH37,R2
034110  103374                        BHIS    30$
034112  010046                        MOV     R0,-(SP)        ;SAVE THE GENERAL REGISTERS
034114  010146                        MOV     R1,-(SP)
034116  010346                        MOV     R3,-(SP)
034120  010446                        MOV     R4,-(SP)
034122  010546                        MOV     R5,-(SP)
034124  010637  014572                MOV     SP,     SAV6    ;SAVE THE STACK
034130  005060  016754                CLR     COUNT0(R0)      ;CLEAR LOOP COUNTER
034134  060000                        ADD     R0,     R0      ;       INDEX TO THE RIGHT COUNTER
034136  060000                        ADD     R0,     R0
034140  060000                        ADD     R0,R0
034142  160100                        SUB     R1,R0
034144  160100                        SUB     R1,R0
034146  012737  034256  014662        MOV     #POWUP, PWRTAB  ;ENABLE GOOD POWER-UP
034154  012737  000001  016752        MOV     #1,LOOPS        ;# OF LOOPS FOR 2 MS (WORST CASE CONTENTION)
034162  000160  034166                JMP     3$(R0)          ;START LOOPING UNTIL DC POWER FAILS
034166  005237  016754          3$:   INC     COUNT0

034172  023737  016752  016754        CMP     LOOPS,COUNT0            ;2MS UP?
034200  001372                        BNE     3$                      ;BRANCH IF NO
034202  000000                        HALT                            ;FINISHED
034204  005237  016756          4$:   INC     COUNT1
034210  023737  016752  016756        CMP     LOOPS,COUNT1
034216  001372                        BNE     4$
034220  000000                        HALT
034222  005237  016760          5$:   INC     COUNT2
034226  023737  016752  016760        CMP     LOOPS,COUNT2
034234  001372                        BNE     5$
034236  000000                        HALT
034240  005237  016762          6$:   INC     COUNT3
034244  023737  016752  016762        CMP     LOOPS,COUNT3
```

```
3079  034252  001372                        BNE     6$
3080  034254  000000                        HALT
3081
3082  034256                          POWUP:
3083  034256  012737  034442  014662        MOV     #ILLDWN,PWRTAB;SET TOO FAST DOWN VECTOR
3084  034264  013706  014572                MOV     SAV6,SP         ;RESET SP
3085  034270  012605                        MOV     (SP)+,R5        ;RESTORE THE REGISTERS
3086  034272  012604                        MOV     (SP)+,R4
3087  034274  012603                        MOV     (SP)+,R3
3088  034276  012601                        MOV     (SP)+,R1
3089  034300  012600                        MOV     (SP)+,R0
3090  034302  012702  170400                MOV     #MAPH37+2,R2    ;RESTORE UNIBUS MAP
3091  034306  012642                  10$:  MOV     (SP)+,-(R2)
3092  034310  022702  170200                CMP     #MAPL00,R2
3093  034314  103774                        BLO     10$
3094  034316  012702  172400                MOV     #KDPAR7+2,R2    ;RESTORE K AND S PARS/PDRS
3095  034322  012642                  20$:  MOV     (SP)+,-(R2)
3096  034324  022702  172200                CMP     #SIPDR0,R2
3097  034330  103774                        BLO     20$
3098  034332  012637  172516                MOV     (SP)+,@#MMR3    ;RESTORE MMR3
3099  034336  012637  177746                MOV     (SP)+,@#CONTRL  ;RESTORE CACHE CONTRL
3100  034342  012637  177776                MOV     (SP)+,@#PSW     ;RESTORE PSW
3101  034346  012702  177700                MOV     #UDPAR7+2,R2    ;RESTORE PSW THRU MMR0
3102  034352  012642                  30$:  MOV     (SP)+,-(R2)
3103  034354  022702  177572                CMP     #MMR0,R2
3104  034360  103774                        BLO     30$
3105  034362  012602                        MOV     (SP)+,R2        ;RESTORE R2
3106  034364  004737  034446                JSR     PC,     TIMIT   ;CHECK THE POWER-DOWN TIME
3107  034370  012737  033774  014662        MOV     #POWDWN,PWRTAB ;RESET THE DOWN VECTOR
3108  034376  105737  016740                TSTB    UBEF            ;UBE BEING USED?
3109  034402  001403                        BEQ     2$              ;BRANCH IF NO
3110  034404  012737  000001  017022        MOV     #1,UBELCK       ;CLEAR THE PF LOCK
3111  034412                          2$:
3112  034412  105737  016737                TSTB    MPF             ;MULTIPROCESSOR MODE?
3113  034416  001403                        BEQ     1$              ;BRANCH IF NO
3114  034420  052737  001000  177746        BIS     #1000,@#CONTRL  ;BYPASS CACHE
3115  034426  052737  000014  177746  1$:   BIS     #14,    @#CONTRL        ;TURN OFF CACHE
3116  034434  000113                        JMP     (R3)            ;JUMP INDIRECT TO R3
3117
3118  034436  000000                  ILLUP:HALT                    ;POWER UP BEFORE POWER DOWN COMPLETE
3119  034440  000776                        BR      .-2             ;LOCK UP THE HALT
3120
3121  034442  000000                  ILLDWN:HALT                   ;POWERED DOWN BEFORE UP COMPLETE
3122  034444  000776                        BR      .-2             ;LOCK UP THE HALT
3123
3124
3125  034446                          TIMIT:
3126  034446  023760  016752  016754        CMP     LOOPS,COUNT0(R0)        ;DID WE HAVE ENOUGH POWER DOWN TIME?
3127  034454  001402                        BEQ     1$              ;BRANCH IF YES
3128  034456  104401  045221                TYPE    ,$DOWN                  ;NOT ENOUGH TIME
3129
3130  034462  000207                  1$:   RTS     PC
3131
3132
3133
3134
```

```
3135                                            .SBTTL  POWER FAIL ROUTINE (SECTION 2)
3136  034464                                $POWER:
3137  034464  005737  014532                      TST     HICORE                  ;DID WE POWER DOWN IN HIGH CORE?
3138  034470  001451                              BEQ     1$                      ;BRANCH IF NO
3139  034472  005037  172340                      CLR     KIPAR0                  ;SET UP PARS 0,1,2,7
3140  034476  012737  077406  172300              MOV     #77406, KIPDR0
3141  034504  012737  000200  172342              MOV     #200,   KIPAR1
3142  034512  012737  077406  172302              MOV     #77406, KIPDR1
3143  034520  012737  000400  172344              MOV     #400,   KIPAR2
3144  034526  012737  077406  172304              MOV     #77406, KIPDR2
3145  034534  012737  177600  172356              MOV     #177600,        KIPAR7
3146  034542  012737  077406  172316              MOV     #77406, KIPDR7
3147  034550  012737  000020  172516              MOV     #20,    MMR3
3148  034556  012737  033534  000250              MOV     #MMERR, MMVEC
3149  034564  063737  014550  172340              ADD     HIBOX,  KIPAR0
3150  034572  063737  014550  172342              ADD     HIBOX,  KIPAR1
3151  034600  063737  014550  172344              ADD     HIBOX,  KIPAR2
3152  034606  052737  000001  177572              BIS     #1,     MMR0            ;POWER-UP IN HIGH CORE
3153  034614                                1$:
3154  034614  017705  162210                      MOV     @ACR,   R5              ;COPY ACR
3155  034620  072527  177770                      ASH     #-10,   R5              ;GET THE ID
3156  034624  005004                              CLR     R4                      ;SET UP R0
3157  034626  026405  014226                65$:  CMP     $CPUID(R4),     R5
3158  034632  001404                              BEQ     64$
3159  034634  005724                              TST     (R4)+
3160  034636  020427  000010                      CMP     R4,     #10
3161  034642  002771                              BLT     65$
3162  034644  010400                64$:  MOV     R4,     R0
3163  034646  010001                              MOV     R0,     R1
3164  034650  006201                              ASR     R1
3165  034652  000170  014662                      JMP     @PWRTAB(R0)             ;JUMP TO THE POWER ROUTINE
3166
3167
3168  034656  012760  035316  014662  $PWRDN: MOV     #$ILLUP,PWRTAB(R0)      ;SET UVECT FOR ILLEGAL UP
3169  034664  032760  000040  014612          BIT     #SSD,PFFT(R0)           ;SEND A SIGNAL?
3170  034672  001403                          BEQ     10$                     ;NO
3171  034674  012737  000001  014642          MOV     #1,     SIGNAL
3172
3173  034702                                10$:
3174  034702  026006  017052                  CMP     YELLIM(R0),SP           ;YELLOW OR RED?
3175  034706  100402                          BMI     1$                      ;NO
3176  034710  016006  014200                  MOV     $$STP(R0),SP            ;SET EMERGENCY STACK
3177  034714  010246                1$:       MOV     R2,-(SP)                ;SAVE R2
3178  034716  012702  177572                  MOV     #MMR0,R2                ;SAVE PSW THRU MMR0
3179  034722  012246                100$:     MOV     (R2)+,-(SP)
3180  034724  022702  177676                  CMP     #UDPAR7,R2
3181  034730  103374                          BHIS    100$
3182  034732  013746  177776                  MOV     @#PSW,-(SP)     ;SAVE PSW
3183  034736  013746  177746                  MOV     @#CONTRL,-(SP)  ;SAVE CACHE CONTRL
3184  034742  013746  172516                  MOV     @#MMR3,-(SP)            ;SAVE MMR3
3185  034746  012702  172200                  MOV     #SIPDR0,R2              ;SAVE SIPDR0 THRU KDPAR7
3186  034752  012246                20$:      MOV     (R2)+,-(SP)
3187  034754  022702  172376                  CMP     #KDPAR7,R2
3188  034760  103374                          BHIS    20$
3189  034762  012702  170200                  MOV     #MAPL00,R2              ;SAVE THE UNIBUS MAP
3190  034766  012246                30$:      MOV     (R2)+,-(SP)
```

```
3191  034770  022702  170376            CMP     #MAPH37,R2
3192  034774  103374                    BHIS    30$
3193  034776  010046                    MOV     R0,-(SP)        ;SAVE THE GENERAL REGISTERS
3194  035000  010146                    MOV     R1,-(SP)
3195  035002  010346                    MOV     R3,-(SP)
3196
3197  035004  010446                    MOV     R4,-(SP)
3198  035006  010546                    MOV     R5,-(SP)
3199  035010  010660  014572    40$:    MOV     SP,     SAV6(R0)        ;SAVE THE STACK
3200  035014  005060  016754            CLR     COUNT0(R0)              ;CLEAR THE LOOP COUNTER
3201  035020  012760  035142  014662    MOV     #$PWRUP,        PWRTAB(R0);GET SET FOR POWER-UP
3202  035026  060000                    ADD     R0,     R0      ;       INDEX TO THE RIGHT COUNTER
3203  035030  060000                    ADD     R0,     R0
3204  035032  060000                    ADD     R0,R0
3205  035034  160100                    SUB     R1,R0
3206  035036  160100                    SUB     R1,R0
3207  035040  012737  000001  016752    MOV     #1,LOOPS                ;# OF LOOPS FOR 2 MS (WORST CASE CONTENTION)
3208  035046  000160  035052            JMP     3$(R0)          ;START LOOPING UNTIL DC POWER FAILS
3209  035052  005237  016754    3$:     INC     COUNT0
3210
3211  035056  023737  016752  016754    CMP     LOOPS,COUNT0            ;2MS UP?
3212  035064  001372                    BNE     3$                      ;BRANCH IF NO
3213  035066  000000                    HALT                            ;FINISHED
3214  035070  005237  016756    4$:     INC     COUNT1
3215  035074  023737  016752  016756    CMP     LOOPS,COUNT1
3216  035102  001372                    BNE     4$
3217  035104  000000                    HALT
3218  035106  005237  016760    5$:     INC     COUNT2
3219  035112  023737  016752  016760    CMP     LOOPS,COUNT2
3220  035120  001372                    BNE     5$
3221  035122  000000                    HALT
3222  035124  005237  016762    6$:     INC     COUNT3
3223  035130  023737  016752  016762    CMP     LOOPS,COUNT3
3224  035136  001372                    BNE     6$
3225  035140  000000                    HALT
3226
3227  035142  012760  035322  014662  $PWRUP: MOV     #ILLDN,PWRTAB(R0)       ;SET VECTOR FOR FAST DOWN
3228  035150  016006  014572            MOV     SAV6(R0),SP             ;RESTORE STACK
3229  035154  012605                    MOV     (SP)+,R5        ;SAVE THE GENERAL REGISTERS
3230  035156  012604                    MOV     (SP)+,R4
3231  035160  012603                    MOV     (SP)+,R3
3232  035162  012601                    MOV     (SP)+,R1
3233  035164  012600                    MOV     (SP)+,R0
3234  035166  012702  170400            MOV     #MAPH37+2,R2    ;RESTORE UNIBUS MAP
3235  035172  012642            10$:    MOV     (SP)+,-(R2)
3236  035174  022702  170200            CMP     #MAPL00,R2
3237  035200  103774                    BLO     10$
3238  035202  012702  172400            MOV     #KDPAR7+2,R2    ;RESTORE K AND S PARS/PDRS
3239  035206  012642            20$:    MOV     (SP)+,-(R2)
3240  035210  022702  172200            CMP     #SIPDR0,R2
3241  035214  103774                    BLO     20$
3242  035216  012637  172516            MOV     (SP)+,@#MMR3    ;RESTORE MMR3
3243  035222  012637  177746            MOV     (SP)+,@#CONTRL  ;RESTORE CACHE CONTRL
3244  035226  012637  177776            MOV     (SP)+,@#PSW     ;RESTORE PSW
3245  035232  012702  177700            MOV     #UDPAR7+2,R2    ;RESTORE PSW THRU MMR0
3246  035236  012642            30$:    MOV     (SP)+,-(R2)
```

```
3247  035240  022702  177572            CMP     #MMR0,R2
3248  035244  103774                    BLO     30$
3249  035246  012602                    MOV     (SP)+,R2        ;RESTORE R2
3250  035250  004737  034446            JSR     PC,     TIMIT           ;CHECK THE POWER DOWN
3251  035254  032760  000020  014612    BIT     #SSU,PFFT(R0)           ;SEND SIGNALS?
3252  035262  001403                    BEQ     45$             ;NO
3253  035264  012737  000001  014642    MOV     #1,     SIGNAL
3254  035272  012737  000001  014712  45$:    MOV     #1,SYNC.1                       ;THIS MAY UNLOCK THE OTHER CPUS
3255  035300  012760  034656  014662    MOV     #$PWRDN,PWRTAB(R0)      ;SET VECTOR FOR POWER FAIL
3256  035306  005703                    TST     R3              ;IS R3 ZERO?
3257  035310  001401                    BEQ     50$             ;YES
3258  035312  010316                    MOV     R3,(SP)         ;FUDGE RETURN ADDRESS ON STACK
3259  035314  000002              50$:  RTI
3260
3261  035316                      $ILLUP:
3262  035316  000000                    HALT                    ;POWER UP BEFORE POWER DOWN COMPLETE
3263  035320  000777                    BR      .               ;HANG UP THE PROCESSOR
3264
3265  035322                      ILLDN:
3266  035322  000000                    HALT                    ;POWER DOWN BEFORE UP COMPLETE
3267  035324  000777                    BR      .
3268
3269
3270
3271
3272                              .SBTTL  END OF PASS ROUTINE
3273
3274                              ;;**************************************************************************
3275                              ;*INCREMENT THE PASS NUMBER ($PASS)
3276                              ;*INDICATE END-OF-PROGRAM AFTER 1 PASSES THRU THE PROGRAM
3277                              ;*TYPE 'END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT
3278                              ;                       CPU #0 > AAAAA
3279                              ;                       CPU #1 > BBBBB
3280                              ;                       CPU #2 > CCCCC
3281                              ;                       CPU #3 > DDDDD
3282                              ;       TOTAL SYSTEM-WIDE ERRORS YYYYY''
3283                              ;*WHERE XXXXX,AAAAA,BBBBB,CCCCC,DDDDD, AND YYYYY ARE DECIMAL NUMBERS
3284                              ;*IF THERES A MONITOR GO TO IT
3285                              ;*IF THERE ISN'T JUMP TO RESTAB
3286
3287  035326                      $EOP:
3288  035326  106237  016776            ASRB    SYNC.3          ;;CONTROL ENTRY
3289  035332  103375                    BCC     $EOP
3290  035334  105737  016737            TSTB    MPF             ;;MP MODE?
3291  035340  001416                    BEQ     4$              ;;BRANCH IF NO
3292  035342  005700                    TST     R0              ;;IS THIS THE MASTER?
3293  035344  001414                    BEQ     4$              ;;YES
3294  035346  005237  014134            INC     $EOPSG
3295  035352  012737  000001  016776    MOV     #1,     SYNC.3  ;;ALLOW ANOTHER CPU IN
3296  035360  005737  014134      1$:   TST     $EOPSG          ;;IS THE MASTER FINISHED?
3297  035364  001375                    BNE     1$              ;;BRANCH IF NO
3298  035366  016006  014200            MOV     $$STP(R0),SP    ;;RESET THE STACK
3299  035372  000170  037064            JMP     @RESTAB(R0)
3300  035376                      4$:
3301  035376  005237  014134            INC     $EOPSG
3302  035402  012737  000001  016776    MOV     #1,     SYNC.3  ;;ALLOW ANOTHER CPU IN
```

```
3303  035410  023737  014134  016774  5$:     CMP     $EOPSG, CPUACT
3304  035416  001374                          BNE     5$
3305  035420  005237  014344                  INC     $PASS           ;;INCREMENT THE PASS NUMBER
3306  035424  042737  100000  014344          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
3307  035432  005327                          DEC     (PC)+           ;;LOOP?
3308  035434  000001              $EOPCT:     .WORD   1
3309  035436  003402                          BLE     1$              ;;YES
3310  035440  000137  036122                  JMP     $DOAGN
3311  035444  012737              1$:         MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
3312  035446  000001              $ENDCT:     .WORD   1
3313  035450  035434                          $EOPCT
3314  035452  104401  035460                  TYPE    ,65$            ;;TYPE ASCIZ STRING
3315  035456  000407                          BR      64$             ;;GET OVER THE ASCIZ
3316                              ;;65$:      .ASCIZ  <12><15>/END PASS #/
3317  035476                      64$:
3318  035476  013746  014344                  MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
3319                                                                  ;;TYPE PASS NUMBER
3320  035502  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
3321  035504  104401  035512                  TYPE    ,67$            ;;TYPE ASCIZ STRING
3322  035510  000421                          BR      66$             ;;GET OVER THE ASCIZ
3323                              ;;67$:      .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
3324  035554                      66$:
3325  035554  105737  016737                  TSTB    MPF
3326  035560  001524                          BEQ     UNIEOP
3327  035562  104401  014333                  TYPE    ,$CRLF
3328  035566  104401  035574                  TYPE    ,69$            ;;TYPE ASCIZ STRING
3329  035572  000404                          BR      68$             ;;GET OVER THE ASCIZ
3330                              ;;69$:      .ASCIZ  /CPU#0 /<76>
3331  035604                      68$:
3332  035604  005003                          CLR     R3
3333  035606  004737  036226                  JSR     PC,EOPLID
3334  035612  016346  014042                  MOV     $ERTTL(R3),-(SP)        ;;SAVE $ERTTL(R3) FOR TYPEOUT
3335  035616  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
3336  035620  104401  014333                  TYPE    ,$CRLF
3337  035624  104401  0356??                  TYPE    ,71$            ;;TYPE ASCIZ STRING
3338  035630  000404                          BR      70$             ;;GET OVER THE ASCIZ
3339                              ;;71$:      .ASCIZ  /CPU#1 /<76>
3340  035642                      70$:
3341  035642  012703  000001                  MOV     #1,R3
3342  035646  004737  036226                  JSR     PC,EOPLID
3343  035652  016346  014042                  MOV     $ERTTL(R3),-(SP)        ;;SAVE $ERTTL(R3) FOR TYPEOUT
3344  035656  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
3345  035660  104401  014333                  TYPE    ,$CRLF
3346  035664  104401  035672                  TYPE    ,73$            ;;TYPE ASCIZ STRING
3347  035670  000404                          BR      72$             ;;GET OVER THE ASCIZ
3348                              ;;73$:      .ASCIZ  /CPU#2 /<76>
3349  035702                      72$:
3350  035702  012703  000002                  MOV     #2,R3
3351  035706  004737  036226                  JSR     PC,EOPLID
3352  035712  016346  014042                  MOV     $ERTTL(R3),-(SP)        ;;SAVE $ERTTL(R3) FOR TYPEOUT
3353  035716  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
3354  035720  104401  014333                  TYPE    ,$CRLF
3355  035724  104401  035732                  TYPE    ,75$            ;;TYPE ASCIZ STRING
3356  035730  000404                          BR      74$             ;;GET OVER THE ASCIZ
3357                              ;;75$:      .ASCIZ  /CPU#3 /<76>
3358  035742                      74$:
```

```
3359  035742  012703  000003                  MOV     #3,R3
3360  035746  004737  036226                  JSR     PC,EOPLID
3361  035752  016346  014042                  MOV     $ERTTL(R3),-(SP)        ;;SAVE $ERTTL(R3) FOR TYPEOUT
3362  035756  104405                          TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
3363  035760  104401  014333                  TYPE    ,$CRLF
3364  035764  104401  035772                  TYPE    ,77$                    ;;TYPE ASCIZ STRING
3365  035770  000420                          BR      76$                     ;;GET OVER THE ASCIZ
3366                                ;;77$:    .ASCIZ  /TOTAL SYSTEMWIDE ERROR COUNT = /
3367  036032                                  76$:
3368  036032                                  UNIEOP:
3369  036032  013746  014224                  MOV     $ERGBL,-(SP)            ;;SAVE $ERGBL FOR TYPEOUT
3370  036036  104405                          TYPDS                           ;;GO TYPE--DECIMAL ASCII WITH SIGN
3371  036040  104401  014333                  TYPE    ,$CRLF
3372  036044  005037  014224                  CLR     $ERGBL
3373  036050  012703  014042                  MOV     #$ERTTL,R3              ;CLEAR THE
3374  036054  005023                          CLR     (R3)+                   ;ERROR TOTALS.
3375  036056  005023                          CLR     (R3)+
3376  036060  005023                          CLR     (R3)+
3377  036062  005023                          CLR     (R3)+
3378  036064  005013                          CLR     (R3)
3379  036066  000400                          BR      99$                     ;SKIP OVER IN SUBROUTINE
3380  036070  000404                  99$:    BR      $GET
3381  036072  013702  000042          $GET42: MOV     @#42,R2                 ;;GET MONITOR ADDRESS
3382  036076  001411                          BEQ     $DOAGN                  ;;BRANCH IF NO MONITOR
3383  036100  000001                          WAIT
3384  036102  013702  000042          $GET:   MOV     @#42,R2                 ;;INSURE R2 CONTAINS THE MONITORS
3385  036106  001405                          BEQ     $DOAGN                  ;;RETURN ADDRESS
3386  036110  000005                          RESET                           ;;CLEAR THE WORLD
3387  036112  004712                  $ENDAD: JSR     PC,(R2)                 ;;GO TO MONITOR
3388  036114  000240                          NOP                             ;;SAVE ROOM
3389  036116  000240                          NOP                             ;;FOR
3390  036120  000240                          NOP                             ;;ACT11
3391  036122  013746  014660          $DOAGN: MOV     $PSWR,  -(SP)
3392  036126  013746  014716                  MOV     TYPQUE, -(SP)
3393  036132  013746  014720                  MOV     TYPQUE+2,       -(SP)
3394  036136  013746  016740                  MOV     UBEF,   -(SP)
3395  036142  013746  016774                  MOV     CPUACT, -(SP)
3396  036146  013746  016736                  MOV     FLAGB,  -(SP)
3397  036152  004737  020000                  JSR     PC,     RESTRT
3398  036156  012637  016736                  MOV     (SP)+,  FLAGB
3399  036162  012637  016774                  MOV     (SP)+,  CPUACT
3400  036166  012637  016740                  MOV     (SP)+,  UBEF
3401  036172  012637  014720                  MOV     (SP)+,  TYPQUE+2
3402  036176  012637  014716                  MOV     (SP)+,  TYPQUE
3403  036202  012637  014660                  MOV     (SP)+,  $PSWR
3404  036206  005037  014134                  CLR     $EOPSG                  ;;CLEAR THE COUNT AND FREE SLAVES
3405  036212  016006  014200                  MOV     $$STP(R0),SP            ;;RESET THE STACK
3406  036216  000170  037064                  JMP     @RESTAB(R0)                     ;RETURN
3407  036222     377     377  000  $ENULL:    .BYTE   -1,-1,0                 ;;NULL CHARACTER STRING
3408          036226                          .EVEN
3409  036226                                  EOPLID:
3410  036226  005002                          CLR     R2                      ;RESET FOR COUNT
3411  036230  026203  014226          65$:    CMP     $CPUID(R2),R3           ;SID MATCH?
3412  036234  001404                          BEQ     64$
3413  036236  005722                          TST     (R2)+                   ;INCREMENT R2 BY 2
3414  036240  020227  000010                  CMP     R2,#10
```

```
3415  036244  002771                          BLT     65$
3416  036246  010203                  64$:    MOV     R2,R3           ;MOV LOGICAL ID TO 2ND OPERAND
3417  036250  000207                          RTS     PC
3418
3419
3420
3421
3422                                  .SBTTL  SCOPE HANDLER ROUTINE
3423
3424                                  ;;**********************************************************************
3425                                  ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
3426                                  ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
3427                                  ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
3428                                  ;*SW14=1         LOOP ON TEST
3429                                  ;*SW09=1         LOOP ON ERROR
3430                                  ;*CALL
3431                                  ;*      SCOPE           ;;SCOPE=IOT
3432
3433  036252                          $SCOPE:
3434  036252  032770  040000  014160  1$:     BIT     #BIT14,@SWR(R0) ;;LOOP ON PRESENT TEST?
3435  036260  001056                          BNE     $OVER           ;;YES IF SW14=1
3436                                  ;######START OF CODE FOR THE XOR TESTER######
3437  036262  000416                  $XTSTR: BR      6$              ;;IF RUNNING ON THE ''XOR'' TESTER CHANGE
3438                                                                  ;;THIS INSTRUCTION TO A ''NOP'' (NOP=240)
3439  036264  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
3440  036270  012737  036310  000004          MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
3441  036276  005737  177060                  TST     @#177060        ;;TIME OUT ON XOR?
3442  036302  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
3443  036306  000423                          BR      $SVLAD          ;;GO TO THE NEXT TEST
3444  036310  022626                  5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
3445  036312  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
3446  036316  000411                          BR      7$              ;;LOOP ON THE PRESENT TEST
3447  036320                          6$:;######END OF CODE FOR THE XOR TESTER######
3448  036320  105761  014006          2$:     TSTB    $ERFLG(R1)      ;;HAS AN ERROR OCCURRED?
3449  036324  001414                          BEQ     $SVLAD          ;;BR IF NO
3450  036326  032770  001000  014160          BIT     #BIT09,@SWR(R0) ;;LOOP ON ERROR?
3451  036334  001002                          BNE     7$              ;;BR IF NO
3452  036336  000160  036352                  JMP     4$(R0)
3453  036342  013760  014032  014022  7$:     MOV     $LPERR,$LPADR(R0)       ;;SET LOOP ADDRESS TO LAST SCOPE
3454  036350  000422                          BR      $OVER
3455  036352  105061  014006          4$:     CLRB    $ERFLG(R1)      ;;ZERO THE ERROR FLAG
3456  036356  105261  014002          $SVLAD: INCB    $TSTNM(R1)      ;;COUNT TEST NUMBERS
3457  036362  005710                          TST     (R0)            ;;IS THIS THE MASTER
3458  036364  001003                          BNE     1$              ;;NO,
3459  036366  116137  014002  014342          MOVB    $TSTNM(R1),$TESTN       ;;SET TEST NUMBER IN APT MAILBOX
3460  036374                          1$:
3461  036374  011660  014022                  MOV     (SP),$LPADR(R0) ;;SAVE SCOPE LOOP ADDRESS
3462  036400  011660  014032                  MOV     (SP),$LPERR(R0) ;;SAVE ERROR LOOP ADDRESS
3463  036404  005060  014322                  CLR     $ESCAPE(R0)     ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
3464  036410  112737  000001  014060          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
3465  036416  113771  014002  014170  $OVER:  MOVB    $TSTNM,@DISPLAY(R1) ;;DISPLAY TEST NUMBER
3466  036424  016016  014022                  MOV     $LPADR(R0),(SP) ;;FUDGE RETURN ADDRESS
3467  036430  000002                          RTI                     ;;FIXES PS
3468
3469
3470
```

```
3471
3472                                    .SBTTL  ERROR HANDLER ROUTINE
3473
3474                                    ;;**********************************************************************
3475                                    ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
3476                                    ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
3477                                    ;*MADE BY THE FAILING PROCESSOR
3478                                    ;*AND TYPE OUT THE PROCESSOR ID AND PC OF THE ERROR INSTRUCTION
3479                                    ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
3480                                    ;*SW15=1        HALT ON ERROR
3481                                    ;*SW09=1        LOOP ON ERROR
3482                                    ;*CALL
3483                                    ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
3484
3485  036432                            $ERROR:
3486  036432  105261  014006            7$:     INCB    $ERFLG(R1)      ;;SET THE ERROR FLAG
3487  036436  001775                            BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
3488  036440  116170  014002  014170            MOVB    $TSTNM(R1),@DISPLAY(R0) ;;DISPLAY TEST NUMBER
3489  036446  005260  014042                    INC     $ERTTL(R0)              ;;INC THE ERROR COUNT
3490  036452  005237  014224                    INC     $ERGBL
3491  036456  011660  014064                    MOV     (SP),$ERRPC(R0) ;;GET ADDRESS OF ERROR INSTRUCTION
3492  036462  162760  000002  014064            SUB     #2,$ERRPC(R0)
3493  036470  117061  014064  014054            MOVB    @$ERRPC(R0),$ITEMB(R1)  ;;STRIP AND SAVE THE ERROR ITEM CODE
3494  036476  010660  014074                    MOV     SP,$ERRSP(R0)   ;;SAVE THE CURRENT STACK POINTER
3495  036502  005770  014160                    TST     @SWR(R0)        ;;HALT ON ERROR?
3496  036506  100025                            BPL     10$             ;;SKIP IF CONTINUE
3497  036510  005700                            TST     R0              ;;IS THIS THE MASTER?
3498  036512  001022                            BNE     3$              ;;NO
3499  036514  104401  036522                    TYPE    ,70$            ;;TYPE ASCIZ STRING
3500  036520  000417                            BR      75$             ;;GET OVER THE ASCIZ
3501  036522  005015  040510  052114  70$:     .ASCIZ  <15><12>/HALT ON MASTER IN $ERROR/<15><12>
3502  036530  047440  020116  040515
3503  036536  052123  051105  044440
3504  036544  020116  042444  051122
3505  036552  051117  005015     000
3506          036560                    .EVEN
3507  036560                            75$:
3508  036560  000000                    3$:     HALT
3509  036562  000413                    10$:    BR      6$              ;;NO LOOP ON ERROR
3510  036564  032770  001000  014160    4$:     BIT     #BIT9,@SWR(R0)  ;;LOOP ON ERROR SWITCH SET?
3511  036572  001402                            BEQ     5$              ;;BR IF NO
3512  036574  016016  014032                    MOV     $LPERR(R0),(SP) ;;FUDGE RETURN ADDRESS
3513  036600  005760  014322            5$:     TST     $ESCAPE(R0)     ;;CHECK FOR AN ESCAPE ADDRESS
3514  036604  001402                            BEQ     6$              ;;BR IF NONE
3515  036606  016016  014322                    MOV     $ESCAPE(R0),(SP) ;;FUDGE RETURN ADDRESS FOR ESCAPE
3516
3517  036612                            6$:
3518  036612  122737  000001  014356            CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
3519  036620  001007                            BNE     11$             ;;NO,SKIP APT ERROR REPORT
3520  036622  116137  014054  036634            MOVB    $ITEMB(R1),21$  ;;SET ITEM NUMBER AS ERROR NUMBER
3521  036630  004737  037112                    JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
3522  036634     000                    21$:    .BYTE   0
3523  036635     000                            .BYTE   0
3524  036636  000777                    22$:    BR      22$             ;;APT ERROR LOOP
3525  036640                            11$:
3526  036640  022737  036112  000042            CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
```

```
3527  036646  001001                    BNE     12$             ;;BRANCH IF NO
3528  036650  000000                    HALT                    ;;YES
3529  036652                        12$:
3530  036652                        $ERRTYP:
3531
3532  036652  106237  017002        64$:    ASRB    ERRLCK
3533  036656  103375                        BCC     64$
3534  036660  010037  017064                MOV     R0,     TYPLCK          ;ALLOW THIS CPU TO ENTER TYPE ROUTINE
3535  036664  005060  017012                CLR     NOPRMP(R0)      ;;PRINT MESSAGES WITH PROMPTS
3536  036670  116105  014054                MOVB    $ITEMB(R1),R5   ;;GET THE ERROR ITEM CODE
3537  036674  072527  000003                ASH     #3,     R5
3538  036700  162705  000010                SUB     #10,    R5
3539  036704  062705  017070                ADD     #$ERRTB,R5      ;;ADD THE ADDR. OF THE ERROR TABLE
3540  036710  011537  036716                MOV     (R5),1$         ;;SET UP TO...
3541  036714  104401                        TYPE                    ;;TYPE THE ERROR HEADER
3542  036716  000000                1$:     .WORD   0
3543  036720  104401  014333                TYPE    ,$CRLF
3544  036724  005725                        TST     (R5)+           ;;INCREMENT R5 BY 2
3545  036726  005715                        TST     (R5)            ;;IS THERE A DATA HEADER?
3546  036730  001406                        BEQ     10$             ;;BRANCH IF NO
3547  036732  011537  036740                MOV     (R5),2$
3548  036736  104401                        TYPE
3549  036740  000000                2$:     .WORD   0
3550  036742  104401  014333                TYPE    ,$CRLF
3551  036746  005725                10$:    TST     (R5)+           ;;INCREMENT R5
3552  036750  005715                        TST     (R5)            ;;IS THERE DATA TO BE TYPED?
3553  036752  001433                        BEQ     20$
3554  036754  011505                        MOV     (R5),R5         ;;GET THE DATA TABLE ADDRESS
3555  036756  005715                15$:    TST     (R5)            ;;ARE WE AT THE END OF THE DATA TABLE?
3556  036760  001430                        BEQ     20$             ;;BRANCH IF YES
3557  036762  000240                        NOP
3558  036764  011537  014524                MOV     (R5),   YYY     ;POINT TO THE LOCATION WITH THE NUMBER
3559  036770  022527  014002                CMP     (R5)+,  #$TSTNM
3560  036774  001405                        BEQ     16$
3561  036776  060037  014524                ADD     R0,     YYY
3562  037002  017746  155516                MOV     @YYY,   -(SP)
3563  037006  000405                        BR      17$
3564  037010  005046                16$:    CLR     -(SP)
3565  037012  060137  014524                ADD     R1,     YYY
3566  037016  117716  155502                MOVB    @YYY,   (SP)
3567  037022  104402                17$:    TYPOC
3568  037024  000240                        NOP
3569  037026  104401  037034                TYPE    ,66$            ;;TYPE ASCIZ STRING
3570  037032  000402                        BR      65$             ;;GET OVER THE ASCIZ
3571                                ;;66$:  .ASCIZ  /   /
3572  037040                        65$:
3573  037040  000746                        BR      15$
3574  037042  104401  014333        20$:    TYPE    ,$CRLF
3575  037046  012737  177777  017064        MOV     #-1,    TYPLCK  ;ALLOW ENTRY INTO TYPE ROUTINE
3576  037054  012737  000001  017002        MOV     #1,ERRLCK
3577
3578  037062  000002                        RTI                     ;;RETURN
3579  037064  021450                RESTAB: TST1                    ;END OF PASS RETURN
3580  037066  021450                        TST1
3581  037070  021450                        TST1
3582  037072  021450                        TST1
```

```
                                        .SBTTL  APT COMMUNICATIONS ROUTINE
                                        ;;**************************************************************************
037074  112737  000001  037340  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
037102  112737  000001  037336  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
037110  000403                  BR      $ATYC
037112  112737  000001  037340  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
037120                          $ATYC:
037120  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037122  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037124  105737  037336          TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
037130  001450                  BEQ     5$              ;;IF NOT:  BR
037132  122737  000001  014356  CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
037140  001031                  BNE     3$              ;;IF NOT:  BR
037142  132737  000100  014357  BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
037150  001425                  BEQ     3$              ;;IF NOT:  BR
037152  017600  000004          MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
037156  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037164  005737  014336          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
037170  001375                  BNE     1$              ;;IF NOT:  WAIT
037172  010037  014352          MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
037176  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
037200  001376                  BNE     2$
037202  163700  014352          SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
037206  006200                  ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
037210  010037  014354          MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
037214  012737  000004  014336  MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
037222  000413                  BR      5$
037224  017637  000004  037250  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
037232  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
037240  013746  177776          MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
037244  004737  040072          JSR     PC,$TYPE        ;;CALL TYPE MACRO
037250  000000                  4$:     .WORD   0
037252                          5$:
037252  105737  037340          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
037256  001416                  BEQ     12$             ;;IF NOT:  BR
037260  005737  014356          TST     $ENV            ;;RUNNING UNDER APT?
037264  001413                  BEQ     12$             ;;IF NOT:  BR
037266  005737  014336          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
037272  001375                  BNE     11$             ;;IF NOT:  WAIT
037274  017637  000004  014340  MOV     @4(SP),$FATAL   ;;GET ERROR #
037302  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037310  005237  014336          INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
037314  105037  037340          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
037320  105037  037337          CLRB    $LFLG           ;;CLEAR LOG FLAG
037324  105037  037336          CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
037330  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
```

```
3639  037332  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
3640  037334  000207                          RTS     PC              ;;RETURN
3641  037336     000                $MFLG:    .BYTE   0               ;;MESSG. FLAG
3642  037337     000                $LFLG:    .BYTE   0               ;;LOG FLAG
3643  037340     000                $FFLG:    .BYTE   0               ;;FATAL FLAG
3644          037342                          .EVEN
3645          000200                APTSIZE=200
3646          000001                APTENV=001
3647          000100                APTSPOOL=100
3648          000040                APTCSUP=040
3649
3650
3651
3652
3653                                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
3654
3655                                ;;**********************************************************************
3656                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
3657                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
3658                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
3659                                ;*CALL:
3660                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
3661                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
3662                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
3663                                ;*      .BYTE   M               ;;M=1 OR 0
3664                                ;*                                      ;;1=TYPE LEADING ZEROS
3665                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
3666                                ;*
3667                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
3668                                ;*$TYPOS OR $TYPOC
3669                                ;*CALL:
3670                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
3671                                ;*      TYPON                   ;;CALL FOR TYPEOUT
3672                                ;*
3673                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
3674                                ;*CALL:
3675                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
3676                                ;*      TYPOC                   ;;CALL FOR TYPEOUT
3677
3678  037342  017646  000000        $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
3679  037346  116637  000001  037635        MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
3680  037354  112637  037637              MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
3681  037360  062716  000002              ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
3682  037364  000406                      BR      $TYPON
3683  037366  112737  000001  037635  $TYPOC: MOVB  #1,$OFILL       ;;SET THE ZERO FILL SWITCH
3684  037374  112737  000006  037637        MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
3685  037402  112737  000005  037634  $TYPON: MOVB  #5,$OCNT        ;;SET THE ITERATION COUNT
3686  037410  010346                      MOV     R3,-(SP)        ;;SAVE R3
3687  037412  010446                      MOV     R4,-(SP)        ;;SAVE R4
3688  037414  010546                      MOV     R5,-(SP)        ;;SAVE R5
3689  037416  113737  037637  037640        MOVB    $OMODE+1,DIGITS ;;GET THE NUMBER OF DIGITS TO TYPE
3690  037424  005437  037640              NEG     DIGITS
3691  037430  062737  000006  037640        ADD     #6,DIGITS               ;;SUBTRACT IT FOR MAX. ALLOWED
3692  037436  113737  037640  037636        MOVB    DIGITS,$OMODE   ;;SAVE IT FOR USE
3693  037444  113737  037635  037640        MOVB    $OFILL,DIGITS   ;;GET THE ZERO FILL SWITCH
3694  037452  016605  000012              MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
```

```
3695  037456  005003                    CLR     R3              ;;CLEAR THE OUTPUT WORD
3696  037460  006105              1$:   ROL     R5              ;;ROTATE MSB INTO 'C'
3697  037462  000404                    BR      3$              ;;GO DO MSB
3698  037464  006105              2$:   ROL     R5              ;;FORM THIS DIGIT
3699  037466  006105                    ROL     R5
3700  037470  006105                    ROL     R5
3701  037472  010503                    MOV     R5,R3
3702  037474  006103              3$:   ROL     R3              ;;GET LSB OF THIS DIGIT
3703  037476  105337  037636            DECB    $OMODE          ;;TYPE THIS DIGIT?
3704  037502  100034                    BPL     7$              ;;BR IF NO
3705  037504  042703  177770            BIC     #177770,R3      ;;GET RID OF JUNK
3706  037510  001003                    BNE     4$              ;;TEST FOR 0
3707  037512  005737  037640            TST     DIGITS          ;;SUPPRESS THIS 0?
3708  037516  001404                    BEQ     5$              ;;BR IF YES
3709  037520  005237  037640      4$:   INC     DIGITS          ;;DON'T SUPPRESS ANYMORE 0'S
3710  037524  052703  000060            BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
3711  037530  052703  000040      5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
3712  037534  013704  037546            MOV     9$,     R4      ;;POINT TO ERRBUF TABLE
3713  037540  110324                    MOVB    R3,     (R4)+   ;;PUT THE CHARACTER IN THE TABLE
3714  037542  105014                    CLRB    (R4)            ;;MAKE IT A MINI-ASCII MSG
3715  037544  104401                    TYPE                    ;;GO TO $TYPE
3716  037546  047266              9$:   ERRBUF                  ;;HERE IS THE LOCATION OF MSG
3717  037550  062737  000002  037546    ADD     #2,     9$      ;;MOVE TO NEXT TABLE LOC
3718  037556  023727  037546  111266    CMP     9$,     #END    ;;AT THE END OF ALLOWED BUF AREA?
3719  037564  002403                    BLT     7$              ;;BRANCH IF NO
3720  037566  012737  047266  037546    MOV     #ERRBUF,9$      ;;ELSE POINT TO BEGINNING AGAIN
3721  037574  105337  037634      7$:   DECB    $OCNT           ;;COUNT BY 1
3722  037600  003331                    BGT     2$              ;;BR IF MORE TO DO
3723  037602  002403                    BLT     6$              ;;BR IF DONE
3724  037604  005237  037640            INC     DIGITS          ;;INSURE LAST DIGIT ISN'T A BLANK
3725  037610  000725                    BR      2$              ;;GO DO THE LAST DIGIT
3726  037612  012605              6$:   MOV     (SP)+,R5        ;;RESTORE R5
3727  037614  012604                    MOV     (SP)+,R4        ;;RESTORE R4
3728  037616  012603                    MOV     (SP)+,R3        ;;RESTORE R3
3729  037620  016666  000002  000004    MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
3730  037626  012616                    MOV     (SP)+,(SP)
3731  037630  000002                    RTI                     ;;RETURN
3732  037632     000              8$:   .BYTE   0               ;;STORAGE FOR ASCII DIGIT
3733  037633     000                    .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
3734  037634     000              $OCNT: .BYTE   0               ;;OCTAL DIGIT COUNTER
3735  037635     000              $OFILL:.BYTE   0               ;;ZERO FILL SWITCH
3736  037636  000000              $OMODE:.WORD   0               ;;NUMBER OF DIGITS TO TYPE
3737  037640  000000              DIGITS:.WORD   0
3738
3739
3740
3741
3742                              .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE
3743
3744                              ;;**********************************************************************
3745                              ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
3746                              ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
3747                              ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
3748                              ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
3749                              ;*REPLACED WITH SPACES.
3750                              ;*CALL:
```

```
                                    ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                                    ;*      TYPDS                   ;;GO TO THE ROUTINE
                                    $TYPDS:
037642                              $TYPDS: MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037642  010046                             MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037644  010146                             MOV     R2,-(SP)        ;;PUSH R2 ON STACK
037646  010246                             MOV     R3,-(SP)        ;;PUSH R3 ON STACK
037650  010346                             MOV     R5,-(SP)        ;;PUSH R5 ON STACK
037652  010546                             MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
037654  012746  020200                     MOV     20(SP),R5       ;;GET THE INPUT NUMBER
037660  016605  000020                     BPL     1$              ;;BR IF INPUT IS POS.
037664  100004                             NEG     R5              ;;MAKE THE BINARY NUMBER POS.
037666  005405                             MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
037670  112766  000055  000001             CLR     R0              ;;ZERO THE CONSTANTS INDEX
037676  005000                      1$:    MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
037700  012703  040062                     MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
037704  112723  000040                     CLR     R2              ;;CLEAR THE BCD NUMBER
037710  005002                      2$:    MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
037712  016001  040052                     SUB     R1,R5           ;;FORM THIS BCD DIGIT
037716  160105                      3$:    BLT     4$              ;;BR IF DONE
037720  002402                             INC     R2              ;;INCREASE THE BCD DIGIT BY 1
037722  005202                             BR      3$
037724  000774                      4$:    ADD     R1,R5           ;;ADD BACK THE CONSTANT
037726  060105                             TST     R2              ;;CHECK IF BCD DIGIT=0
037730  005702                             BNE     5$              ;;FALL THROUGH IF 0
037732  001002                             TSTB    (SP)            ;;STILL DOING LEADING 0'S?
037734  105716                             BMI     7$              ;;BR IF YES
037736  100407                      5$:    ASLB    (SP)            ;;MSD?
037740  106316                             BCC     6$              ;;BR IF NO
037742  103003                             MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
037744  116663  000001  177777             BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
037752  052702  000060              6$:    BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
037756  052702  000040              7$:    MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
037762  110223                             TST     (R0)+           ;;JUST INCREMENTING
037764  005720                             CMP     R0,#10          ;;CHECK THE TABLE INDEX
037766  020027  000010                     BLT     2$              ;;GO DO THE NEXT DIGIT
037772  002746                             BGT     8$              ;;GO TO EXIT
037774  003002                             MOV     R5,R2           ;;GET THE LSD
037776  010502                             BR      6$              ;;GO CHANGE TO ASCII
040000  000764                      8$:    TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
040002  105726                             BPL     9$              ;;BR IF NO
040004  100003                             MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
040006  116663  177777  177776      9$:    CLRB    (R3)            ;;SET THE TERMINATOR
040014  105013                             MOV     (SP)+,R5        ;;POP STACK INTO R5
040016  012605                             MOV     (SP)+,R3        ;;POP STACK INTO R3
040020  012603                             MOV     (SP)+,R2        ;;POP STACK INTO R2
040022  012602                             MOV     (SP)+,R1        ;;POP STACK INTO R1
040024  012601                             MOV     (SP)+,R0        ;;POP STACK INTO R0
040026  012600                             NOP
040030  000240                             TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
040032  104401  040062                     NOP
040036  000240                             MOV     2(SP),4(SP)     ;;ADJUST THE STACK
040040  016666  000002  000004             MOV     (SP)+,(SP)
040046  012616                             RTI                     ;;RETURN TO USER
040050  000002
040052  023420              $DTBL:  10000.
```

```
                                        1000.
                                        100.
                                        10.
                        $DBLK:          .BLKW   4


                        .SBTTL  TYPE SERVICE
                        $TYPE:
                                BITB    #40,    $ENVM           ;INHIBIT PRINT OUT?
                                BEQ     6$              ;BRANCH IF NO
                                ADD     #2,     (SP)    ;SET RETURN
                                RTI
                        6$:
                                TST     ERRLCK                  ;IS A CPU IN THE ERROR ROUTINE?
                                BNE     3$                      ;BRANCH IF NO
                                CMP     R0,     TYPLCK          ;IS THIS CPU FROM THE ERROR ROUTINE?
                                BNE     $TYPE                   ;BRANCH IF NO
                        3$:     MOV     R2,     -(SP)           ;STORE REGISTERS USED IN THIS PROGRAM
                                MOV     R3,     -(SP)
                                MOV     R4,     -(SP)
                                MOV     R5,     -(SP)
                                TSTB    MPF
                                BNE     1$
                                MOV     #400,   R4      ;DONT TYPE A CPUID
                                BR      2$
                        1$:     MOV     @ACR,   R5              ;PUT SELF ID INTO R5
                                ASH     #-10,   R5
                                MOV     R5,     R4              ;PUT ID INTO R4
                                MOV     NOPRMP(R0),R2   ;COPY THE PROMPT FLAG
                                SWAB    R2              ;GET IT INTO THE LEFT HALF
                                BIS     R2,R4           ;PUT IT IN R5
                                MOV     #1,     NOPRMP(R0)
                        2$:     ASRB    TQL1            ;ENTER TYPQUE CRITICAL SECTION
                                BCC     2$
                                ;;******** ENQUE *********
                                MOV     TYPQUE+2,R3     ;COPY REAR INDEX
                                TST     (R3)+           ;INCREMENT BY 2
                        64$:    MOV     R4,(R3) ;QUEUE THE ELEMENT
                                MOV     R3,TYPQUE+2     ;UPDATE THE REAR INDEX
                                ;;*************************
                        4$:
                                ;;******** ENQUE *********
                                MOV     TYPQUE+2,R3     ;COPY REAR INDEX
                                TST     (R3)+           ;INCREMENT BY 2
                        65$:    MOV     10(SP),(R3)     ;QUEUE THE ELEMENT
                                MOV     R3,TYPQUE+2     ;UPDATE THE REAR INDEX
                                ;;*************************
                                MOV     @(R3)+, -(R3)   ;GET PC OF MSG
                        5$:     MOV     #1,TQL1         ;CLEAR CRITICAL SECTION
                                TST     R0              ;IS THIS THE MASTER?
                                BEQ     11$             ;BRANCH IF YES.
                                MOV     (SP)+,  R5      ;RESTORE THE REGISTERS
                                MOV     (SP)+,  R4
                                MOV     (SP)+,  R3
```

```
3863  040262  012602                          MOV     (SP)+,  R2
3864  040264  062716  000002                  ADD     #2,     (SP)
3865  040270  000002                          RTI                             ;RETURN
3866  040272                          10$:
3867  040272  106237  017024          11$:    ASRB    TQL1                    ;ENTER CRITICAL SECTOR
3868  040276  103375                          BCC     11$
3869  040300                          HERE:
3870                                          ;;****** DEQUE **********
3871  040300  023737  014716  014720          CMP     TYPQUE,TYPQUE+2 ;;ARE THE INDICIES EQUAL?
3872  040306  001456                          BEQ     13$             ;;YES,THE QUEUE IS EMPTY
3873  040310  013703  014716                  MOV     TYPQUE,R3               ;;COPY FRONT INDEX INTO R3
3874  040314  005723                          TST     (R3)+           ;;INC. R3 BY TWO
3875  040316  011304                          MOV     (R3),R4 ;;DEQUEUE AN ELEMENT
3876  040320  010337  014716                  MOV     R3,TYPQUE               ;;UPDATE FRONT INDEX
3877                                          ;;*************************
3878  040324  032704  000400                  BIT     #BIT8,R4        ;WAS THE NOPRMP(R0) BIT SET?
3879  040330  001025                          BNE     12$
3880  040332  062704  021060                  ADD     #'0',R4         ;MAKE CPUID A CHARACTER
3881  040336  112702  000015                  MOVB    #CR,R2          ;TYPE # CARRAGE RETURN
3882  040342  004737  040504                  JSR     PC,TYPIT        ;TYPE CRLF
3883  040346  112702  000012                  MOVB    #LF,R2
3884  040352  004737  040504                  JSR     PC,TYPIT        ;TYPE IT
3885  040356  110402                          MOVB    R4,R2           ;CPU ID
3886  040360  004737  040504                  JSR     PC,TYPIT
3887  040364  112702  021076                  MOVB    #'>',R2         ; '>'
3888  040370  004737  040504                  JSR     PC,TYPIT        ;TYPE IT
3889  040374  112702  021040                  MOVB    #' ',R2
3890  040400  004737  040504                  JSR     PC,TYPIT        ;TYPE A SPACE
3891  040404                          12$:
3892                                          ;;****** DEQUE **********
3893  040404  023737  014716  014720          CMP     TYPQUE,TYPQUE+2 ;;ARE THE INDICIES EQUAL?
3894  040412  001414                          BEQ     13$             ;;YES,THE QUEUE IS EMPTY
3895  040414  013703  014716                  MOV     TYPQUE,R3               ;;COPY FRONT INDEX INTO R3
3896  040420  005723                          TST     (R3)+           ;;INC. R3 BY TWO
3897  040422  011304                          MOV     (R3),R4 ;;DEQUEUE AN ELEMENT
3898  040424  010337  014716                  MOV     R3,TYPQUE               ;;UPDATE FRONT INDEX
3899                                          ;;*************************
3900  040430  112402                  14$:    MOVB    (R4)+,R2        ;GET A CHARECTER
3901  040432  005702                          TST     R2
3902  040434  001721                          BEQ     HERE            ;WE'RE DONE ,R2 IS CLEAR
3903  040436  004737  040504                  JSR     PC,TYPIT        ;TYPE THE CHARECTER
3904  040442  000772                          BR      14$             ;LOOP
3905  040444  012737  014722  014716  13$:    MOV     #TYPQUE+4,      TYPQUE
3906  040452  012737  014722  014720          MOV     #TYPQUE+4,      TYPQUE+2
3907  040460  012737  000001  017024          MOV     #1,     TQL1                    ;RETURN
3908  040466  012605                          MOV     (SP)+,  R5      ;RESTORE THE REGISTERS
3909  040470  012604                          MOV     (SP)+,  R4
3910  040472  012603                          MOV     (SP)+,  R3
3911  040474  012602                          MOV     (SP)+,  R2
3912  040476  062716  000002                  ADD     #2,     (SP)
3913  040502  000002                          RTI
3914
3915  040504  105777  153504          TYPIT:  TSTB    @$TPS           ;WAIT UNTIL PRINTER IS READY
3916  040510  100375                          BPL     TYPIT
3917  040512  110277  153500                  MOVB    R2,@$TPB                ;TYPE THE CHARACTER
3918  040516  000207                          RTS     PC              ;RETURN
```

```
                                .SBTTL  TRAP DECODER

                                ;;*******************************************************************
                                ;;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE ''TRAP'' INSTRUCTION
                                ;;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                ;;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                ;;*GO TO THAT ROUTINE.

040520  010260  014552          $TRAP:  MOV     R2,     SAVRG(R0)
040524  011602                  1$:     MOV     (SP),R2                 ;;GET TRAP ADDRESS
040526  005742                          TST     -(R2)                   ;;BACKUP BY 2
040530  111202                          MOVB    (R2),R2                 ;;GET RIGHT BYTE OF TRAP
040532  006302                          ASL     R2                      ;;POSITION FOR INDEXING
040534  016202  040566                  MOV     $TRPAD(R2),R2           ;;INDEX TO TABLE
040540  010260  014562                  MOV     R2,     ROUTE(R0)
040544  016002  014552                  MOV     SAVRG(R0),      R2
040550  000170  014562                  JMP     @ROUTE(R0)



                                ;;THIS IS USE TO HANDLE THE ''GETPRI'' MACRO

040554  011646                  $TRAP2: MOV     (SP),-(SP)              ;;MOVE THE PC DOWN
040556  016666  000004  000002          MOV     4(SP),2(SP)             ;;MOVE THE PSW DOWN
040564  000002                          RTI                             ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

                                ;;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                ;;*BY THE ''TRAP'' INSTRUCTION.

                                ;       ROUTINE
                                ;       -------
040566  040554                  $TRPAD: .WORD   $TRAP2
040570  040072                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
040572  037366                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
040574  037342                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
040576  037402                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
040600  037642                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)



040602  000170  014672          ISTDIS: JMP     @ISTTAB(R0)             ;IIST INTERRUPT DISPATCHER

040606  012737  177777  014602  PWRDIS: MOV     #-1,FLAG                ;FIRST INSTRUCTION FLAG
040614  005037  014602                  CLR     FLAG                    ;NOW CLEAR IT
040620  000177  154036                  JMP     @PWRTAB
040624  000170  014702          ERRDIS: JMP     @ERRTAB(R0)             ;CPU ERROR DISPATCHER

040630                          CPUER:
040630  013760  177766  014250          MOV     @#CPUERR,$REG1(R0)              ;CPU ERROR REG.
040636  104005                          ERROR   5
```

```
3975  040640  000000                          HALT
3976  040642  000002                          RTI                     ;RETURN
3977                                          .SBTTL  DATA AREA
3978  040644  005015  042503  041113  TM1:    .ASCIZ  <CR><LF>\CEKBG-C  11/70 POW FAIL\
3979  040652  026507  020103  030440
3980  040660  027461  030067  050040
3981  040666  053517  043040  044501
3982  040674  000114
3983  040676  005015  053523  052111  TM2:    .ASCIZ  <CR><LF>\SWITCH REGISTER = \
3984  040704  044103  051040  043505
3985  040712  051511  042524  020122
3986  040720  020075     000
3987  040723     015  055412  047125  TM4:    .ASCIZ  <CR><LF>/[UNIBUS EXERCISER WILL BE USED]/
3988  040730  041111  051525  042440
3989  040736  042530  041522  051511
3990  040744  051105  053440  046111
3991  040752  020114  042502  052440
3992  040760  042523  056504     000
3993  040765     015  055412  047125  TM5:    .ASCIZ  <CR><LF>/[UNIBUS EXERCISER WILL NOT BE USED]/
3994  040772  041111  051525  042440
3995  041000  042530  041522  051511
3996  041006  051105  053440  046111
3997  041014  020114  047516  020124
3998  041022  042502  052440  042523
3999  041030  056504     000
4000  041033     015  055412  052515  TM6:    .ASCIZ  <CR><LF>/[MULTIPROCESSOR MODE IS IN EFFECT]/
4001  041040  052114  050111  047522
4002  041046  042503  051523  051117
4003  041054  046440  042117  020105
4004  041062  051511  044440  020116
4005  041070  043105  042506  052103
4006  041076  000135
4007  041100  005015  052533  044516  TM7:    .ASCIZ  <CR><LF>/[UNIPROCESSOR MODE IS IN EFFECT]/
4008  041106  051120  041517  051505
4009  041114  047523  020122  047515
4010  041122  042504  044440  020123
4011  041130  047111  042440  043106
4012  041136  041505  056524     000
4013  041143     040  047533  044124  TM10:   .ASCIZ  / [OTHER CPUS ARE RUNNING.]/
4014  041150  051105  041440  052520
4015  041156  020123  051101  020105
4016  041164  052522  047116  047111
4017  041172  027107  000135
4018  041176  005015  041407  052520  TM11:   .ASCIZ  <CR><LF><07>/CPU #/
4019  041204  021440     000
4020  041207     040  050123  041505  TM12:   .ASCIZ  / SPECIFIED BUT NOT ACTIVE/
4021  041214  043111  042511  020104
4022  041222  052502  020124  047516
4023  041230  020124  041501  044524
4024  041236  042526     000
4025  041241     015  044412  052116  TM13:   .ASCII  <CR><LF>/INTERRUPT THE POWER AFTER THE TEST NUMBER APPEARS/
4026  041246  051105  052522  052120
4027  041254  052040  042510  050040
4028  041262  053517  051105  040440
4029  041270  052106  051105  052040
4030  041276  042510  052040  051505
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4031  041304  020124  052516  041115
4032  041312  051105  040440  050120
4033  041320  040505  051522
4034  041324  044440  020116  044124          .ASCII  / IN THE DISPLAY./<CR><LF>
4035  041332  020105  044504  050123
4036  041340  040514  027131  005015
4037  041346  043111  054440  052517          .ASCII  /IF YOU HAVE AN RD CONSOLE, INTERRUPT THE POWER/
4038  041354  044040  053101  020105
4039  041362  047101  051040  020104
4040  041370  047503  051516  046117
4041  041376  026105  044440  052116
4042  041404  051105  052522  052120
4043  041412  052040  042510  050040
4044  041420  053517  051105
4045  041424  005015  052101  052040          .ASCII  <CR><LF>/AT THE END OF THIS MESSAGE.  THEREAFTER,INTERRUPT THE POWER 15(
4046  041432  042510  042440  042116
4047  041440  047440  020106  044124
4048  041446  051511  046440  051505
4049  041454  040523  042507  020056
4050  041462  052040  042510  042522
4051  041470  043101  042524  026122
4052  041476  047111  042524  051122
4053  041504  050125  020124  044124
4054  041512  020105  047520  042527
4055  041520  020122  032461  034050
4056  041526  020051  047515  042522
4057  041534  052040  046511  051505
4058  041542  005015  047524  051040          .ASCIZ  <CR><LF>/TO REACH THE END OF SECTION 1./<CR><LF>
4059  041550  040505  044103  052040
4060  041556  042510  042440  042116
4061  041564  047440  020106  042523
4062  041572  052103  047511  020116
4063  041600  027061  005015     000
4064  041605     015  005012  047105  TM14:   .ASCIZ<CR><LF><LF>/ENTERING SECTION 1/<CR><LF>
4065  041612  042524  044522  043516
4066  041620  051440  041505  044524
4067  041626  047117  030440  005015
4068  041634     000
4069  041635     015  005012  047105  TM15:   .ASCIZ<CR><LF><LF>/ENTERING SECTION 2/<CR><LF>
4070  041642  042524  044522  043516
4071  041650  051440  041505  044524
4072  041656  047117  031040  005015
4073  041664     000
4074  041665     012  052015  042510  TM76:   .ASCIZ<12><15>/THE MASTER IS CPU #/
4075  041672  046440  051501  042524
4076  041700  020122  051511  041440
4077  041706  052520  021440     000
4078  041713     012  006412  042524  TM77:   .ASCIZ<12><12><15>/TEST /
4079  041720  052123  000040
4080  041724  005015  047520  042527  TM100:  .ASCIZ  <CR><LF>/POWER FAIL CPU # /
4081  041732  020122  040506  046111
4082  041740  041440  052520  021440
4083  041746  000040
4084  041750  005015  047012  020117  TM101:  .ASCIZ  <CR><LF><LF>/NO MASSBUS DEVICE AVAILABLE ON CPU # /
4085  041756  040515  051523  052502
4086  041764  020123  042504  044526
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 4087  041772  042503  040440  040526
 4088  042000  046111  041101  042514
 4089  042006  047440  020116  050103
 4090  042014  020125  020043     000
 4091  042021     015  050012  047522  TM102:  .ASCIZ  <CR><LF>/PROCEEDING TO NEXT CPU/
 4092  042026  042503  042105  047111
 4093  042034  020107  047524  047040
 4094  042042  054105  020124  050103
 4095  042050  000125
 4096  042052  005015  047520  042527  TM103:  .ASCIZ  <CR><LF>/POWER FAILURE ON CPU AS EXPECTED/
 4097  042060  020122  040506  046111
 4098  042066  051125  020105  047117
 4099  042074  041440  052520  040440
 4100  042102  020123  054105  042520
 4101  042110  052103  042105     000
 4102  042115     015  043412  052105  TM104:  .ASCII  <CR><LF>/GET SET TO POWER FAIL ENTIRE SYSTEM.../
 4103  042122  051440  052105  052040
 4104  042130  020117  047520  042527
 4105  042136  020122  040506  046111
 4106  042144  042440  052116  051111
 4107  042152  020105  054523  052123
 4108  042160  046505  027056     056
 4109  042165     012  006412  052520          .ASCII<12><12><15>/PUT BATTERY BACKUP ON ALL MEM BOXES/
 4110  042172  020124  040502  052124
 4111  042200  051105  020131  040502
 4112  042206  045503  050125  047440
 4113  042214  020116  046101  020114
 4114  042222  042515  020115  047502
 4115  042230  042530     123
 4116  042233     012  046415  045501          .ASCII<12><15>/MAKE ALL MEMORY PORTS ONLINE/
 4117  042240  020105  046101  020114
 4118  042246  042515  047515  054522
 4119  042254  050040  051117  051524
 4120  042262  047440  046116  047111
 4121  042270     105
 4122  042271     012  046415  045501          .ASCII<12><15>/MAKE ALL CPU POWER-UP SWITCHES 'RUN OR HALT''/
 4123  042276  020105  046101  020114
 4124  042304  050103  020125  047520
 4125  042312  042527  026522  050125
 4126  042320  051440  044527  041524
 4127  042326  042510  020123  051042
 4128  042334  047125  047440  020122
 4129  042342  040510  052114     042
 4130  042347     012  006412  044124          .ASCII<12><12><15>/THEN POWER FAIL THE ENTIRE SYSTEM/
 4131  042354  047105  050040  053517
 4132  042362  051105  043040  044501
 4133  042370  020114  044124  020105
 4134  042376  047105  044524  042522
 4135  042404  051440  051531  042524
 4136  042412     115
 4137  042413     012  006412  042522          .ASCII<12><12><15>/RESTORE POWER 5 SECONDS AFTER POWER FAIL/
 4138  042420  052123  051117  020105
 4139  042426  047520  042527  020122
 4140  042434  020065  042523  047503
 4141  042442  042116  020123  043101
 4142  042450  042524  020122  047520
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 4143  042456  042527  020122  040506
 4144  042464  046111
 4145  042466  006412  040505  044103          .ASCIZ<12><15>/EACH CPU SHOULD REPORT A POWER FAIL/
 4146  042474  041440  052520  051440
 4147  042502  047510  046125  020104
 4148  042510  042522  047520  052122
 4149  042516  040440  050040  053517
 4150  042524  051105  043040  044501
 4151  042532  000114
 4152  042534  005015  043412  052105  TM106:  .ASCIZ  <CR><LF><LF>/GET SET TO POWER FAIL MEM BOX # /
 4153  042542  051440  052105  052040
 4154  042550  020117  047520  042527
 4155  042556  020122  040506  046111
 4156  042564  046440  046505  041040
 4157  042572  054117  021440  000040
 4158  042600  005012  050015  052125  TM107:  .ASCII<12><12><15> /PUT BATTERY BACKUP ON ALL MEMORY BOXES/
 4159  042606  041040  052101  042524
 4160  042614  054522  041040  041501
 4161  042622  052513  020120  047117
 4162  042630  040440  046114  046440
 4163  042636  046505  051117  020131
 4164  042644  047502  042530     123
 4165  042651     012  046415  045501          .ASCII<12><15>/MAKE ALL MEMORY PORTS ONLINE/
 4166  042656  020105  046101  020114
 4167  042664  042515  047515  054522
 4168  042672  050040  051117  051524
 4169  042700  047440  046116  047111
 4170  042706     105
 4171  042707     012  046415  045501          .ASCII<12><15>/MAKE ALL CPU POWER-UP SWITCHES 'RUN OR HALT'/
 4172  042714  020105  046101  020114
 4173  042722  050103  020125  047520
 4174  042730  042527  026522  050125
 4175  042736  051440  044527  041524
 4176  042744  042510  020123  051042
 4177  042752  047125  047440  020122
 4178  042760  040510  052114     042
 4179  042765     012  006412  044124          .ASCII<12><12><15>/THEN POWER FAIL THE MEM BOX/
 4180  042772  047105  050040  053517
 4181  043000  051105  043040  044501
 4182  043006  020114  044124  020105
 4183  043014  042515  020115  047502
 4184  043022     130
 4185  043023     012  006412  042522          .ASCII<12><12><15>/RESTORE POWER 5 SECONDS AFTER POWER FAIL/
 4186  043030  052123  051117  020105
 4187  043036  047520  042527  020122
 4188  043044  020065  042523  047503
 4189  043052  042116  020123  043101
 4190  043060  042524  020122  047520
 4191  043066  042527  020122  040506
 4192  043074  046111
 4193  043076  006412  044124  047105          .ASCII<12><15>/THEN TYPE ANY CHARACTER AT THE MASTER CONSOLE/
 4194  043104  052040  050131  020105
 4195  043112  047101  020131  044103
 4196  043120  051101  041501  042524
 4197  043126  020122  052101  052040
 4198  043134  042510  046440  051501
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 4199  043142  042524  020122  047503
 4200  043150  051516  046117     105
 4201  043155     012  042415  041501          .ASCIZ<12><15>/EACH CPU SHOULD REPORT A POWER FAILURE/
 4202  043162  020110  050103  020125
 4203  043170  044123  052517  042114
 4204  043176  051040  050105  051117
 4205  043204  020124  020101  047520
 4206  043212  042527  020122  040506
 4207  043220  046111  051125  000105
 4208  043226  005012  050015  052125  TM108:  .ASCII<12><12><15>/PUT BATTERY BACKUP ON ALL MEMORY BOXES/
 4209  043234  041040  052101  042524
 4210  043242  054522  041040  041501
 4211  043250  052513  020120  047117
 4212  043256  040440  046114  046440
 4213  043264  046505  051117  020131
 4214  043272  047502  042530     123
 4215  043277     012  046415  045501          .ASCII<12><15>/MAKE ALL MEMORY PORTS OFFLINE ON MEM BOX TO BE POWER-FAILED/
 4216  043304  020105  046101  020114
 4217  043312  042515  047515  054522
 4218  043320  050040  051117  051524
 4219  043326  047440  043106  044514
 4220  043334  042516  047440  020116
 4221  043342  042515  020115  047502
 4222  043350  020130  047524  041040
 4223  043356  020105  047520  042527
 4224  043364  026522  040506  046111
 4225  043372  042105
 4226  043374  006412  040515  042513          .ASCII<12><15>/MAKE ALL CPU POWER-UP SWITCHES 'RUN OR HALT'/
 4227  043402  040440  046114  041440
 4228  043410  052520  050040  053517
 4229  043416  051105  052455  020120
 4230  043424  053523  052111  044103
 4231  043432  051505  021040  052522
 4232  043440  020116  051117  044040
 4233  043446  046101  021124
 4234  043452  005012  052015  042510          .ASCII<12><12><15>/THEN POWER FAIL THE MEM BOX/
 4235  043460  020116  047520  042527
 4236  043466  020122  040506  046111
 4237  043474  052040  042510  046440
 4238  043502  046505  041040  054117
 4239  043510  005012  051015  051505          .ASCII<12><12><15>/RESTORE POWER 5 SECONDS AFTER POWER FAIL/
 4240  043516  047524  042522  050040
 4241  043524  053517  051105  032440
 4242  043532  051440  041505  047117
 4243  043540  051504  040440  052106
 4244  043546  051105  050040  053517
 4245  043554  051105  043040  044501
 4246  043562     114
 4247  043563     012  051015  051505          .ASCII<12><15>/RESTORE ALL MEMORY PORTS ONLINE/
 4248  043570  047524  042522  040440
 4249  043576  046114  046440  046505
 4250  043604  051117  020131  047520
 4251  043612  052122  020123  047117
 4252  043620  044514  042516
 4253  043624  006412  044124  047105          .ASCII<12><15>/THEN TYPE ANY CHARACTER AT THE MASTER CONSOLE/
 4254  043632  052040  050131  020105
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 4255  043640  047101  020131  044103
 4256  043646  051101  041501  042524
 4257  043654  020122  052101  052040
 4258  043662  042510  046440  051501
 4259  043670  042524  020122  047503
 4260  043676  051516  046117     105
 4261  043703     012  047015  020117          .ASCIZ<12><15>/NO CPU SHOULD REPORT A POWER FAILURE/
 4262  043710  050103  020125  044123
 4263  043716  052517  042114  051040
 4264  043724  050105  051117  020124
 4265  043732  020101  047520  042527
 4266  043740  020122  040506  046111
 4267  043746  051125  000105
 4268  043752  006412  053412  051101  $PGM1:  .ASCIZ <12><15><12>/WARNING:  DRIVE # /
 4269  043760  044516  043516  020072
 4270  043766  042040  044522  042526
 4271  043774  021440  000040
 4272  044000  006412  047117  041440  $PGM2:  .ASCIZ<12><15> /ON CPU # /
 4273  044006  052520  021440  000040
 4274  044014  006412  051511  050040  $PGM3:  .ASCII <12><15>/IS PROGRAMMABLE OVER BOTH A AND B PORTS/
 4275  044022  047522  051107  046501
 4276  044030  040515  046102  020105
 4277  044036  053117  051105  041040
 4278  044044  052117  020110  020101
 4279  044052  047101  020104  020102
 4280  044060  047520  052122     123
 4281  044065     012  052015  042510          .ASCIZ<12><15>/THE DRIVE WILL BE USED LATER IN THIS DIAGNOSTIC/
 4282  044072  042040  044522  042526
 4283  044100  053440  046111  020114
 4284  044106  042502  052440  042523
 4285  044114  020104  040514  042524
 4286  044122  020122  047111  052040
 4287  044130  044510  020123  044504
 4288  044136  043501  047516  052123
 4289  044144  041511     000
 4290  044147     012  047015  020117  NODEV:  .ASCIZ <12><15>/NO MASSBUS DEVICES ON CPU # /
 4291  044154  040515  051523  052502
 4292  044162  020123  042504  044526
 4293  044170  042503  020123  047117
 4294  044176  041440  052520  021440
 4295  044204  000040
 4296  044206  005012  047415  046116  TM109:  .ASCIZ <12><12><15>/ONLY ONE MEMORY BOX ONLINE- SKIPPING THIS TEST/
 4297  044214  020131  047117  020105
 4298  044222  042515  047515  054522
 4299  044230  041040  054117  047440
 4300  044236  046116  047111  026505
 4301  044244  051440  044513  050120
 4302  044252  047111  020107  044124
 4303  044260  051511  052040  051505
 4304  044266  000124
 4305  044270  005012  042015  051511  TM110:  .ASCII<12><12><15>/DISABLE BATTERY BACKUP ON MEM BOX TO BE POWER-FAILED/
 4306  044276  041101  042514  041040
 4307  044304  052101  042524  054522
 4308  044312  041040  041501  052513
 4309  044320  020120  047117  046440
 4310  044326  046505  041040  054117
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 4311  044334  052040  020117  042502
 4312  044342  050040  053517  051105
 4313  044350  043055  044501  042514
 4314  044356     104
 4315  044357     012  050015  052125          .ASCII<12><15>/PUT ALL SLAVE CPU MEM PORTS ONLINE/
 4316  044364  040440  046114  051440
 4317  044372  040514  042526  041440
 4318  044400  052520  046440  046505
 4319  044406  050040  051117  051524
 4320  044414  047440  046116  047111
 4321  044422     105
 4322  044423     012  046415  045501          .ASCII<12><15>/MAKE MASTER CPU MEM PORT OFFLINE ON BOX TO BE POWER-FAILED/
 4323  044430  020105  040515  052123
 4324  044436  051105  041440  052520
 4325  044444  046440  046505  050040
 4326  044452  051117  020124  043117
 4327  044460  046106  047111  020105
 4328  044466  047117  041040  054117
 4329  044474  052040  020117  042502
 4330  044502  050040  053517  051105
 4331  044510  043055  044501  042514
 4332  044516     104
 4333  044517     012  046415  045501          .ASCII<12><15>/MAKE ALL CPU POWER-UP SWITCHES 'RUN OR BOOT''/
 4334  044524  020105  046101  020114
 4335  044532  050103  020125  047520
 4336  044540  042527  026522  050125
 4337  044546  051440  044527  041524
 4338  044554  042510  020123  051042
 4339  044562  047125  047440  020122
 4340  044570  047502  052117     042
 4341  044575     012  006412  044124          .ASCII<12><12><15>/THEN POWER FAIL THE MEM BOX/
 4342  044602  047105  050040  053517
 4343  044610  051105  043040  044501
 4344  044616  020114  044124  020105
 4345  044624  042515  020115  047502
 4346  044632     130
 4347  044633     012  006412  042522          .ASCII<12><12><15>/RESTORE POWER 5 SECONDS AFTER POWER FAIL/
 4348  044640  052123  051117  020105
 4349  044646  047520  042527  020122
 4350  044654  020065  042523  047503
 4351  044662  042116  020123  043101
 4352  044670  042524  020122  047520
 4353  044676  042527  020122  040506
 4354  044704  046111
 4355  044706  006412  042522  052123          .ASCII<12><15>/RESTORE ALL MEM PORTS ONLINE/
 4356  044714  051117  020105  046101
 4357  044722  020114  042515  020115
 4358  044730  047520  052122  020123
 4359  044736  047117  044514  042516
 4360  044744  006412  042522  052123          .ASCII<12><15>/RESTORE ALL CPU POWER-UP SWITCHES TO 'RUN OR HALT''/
 4361  044752  051117  020105  046101
 4362  044760  020114  050103  020125
 4363  044766  047520  042527  026522
 4364  044774  050125  051440  044527
 4365  045002  041524  042510  020123
 4366  045010  047524  021040  052522
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4367  045016  020116  051117  044040
4368  045024  046101  021124
4369  045030  006412  044124  047105          .ASCII<12><15>/THEN TYPE ANY CHARACTER AT THE MASTER CONSOLE/
4370  045036  052040  050131  020105
4371  045044  047101  020131  044103
4372  045052  051101  041501  042524
4373  045060  020122  052101  052040
4374  045066  042510  046440  051501
4375  045074  042524  020122  047503
4376  045102  051516  046117    105
4377  045107     012  042415  041501          .ASCIZ<12><15>/EACH SLAVE CPU SHOULD REPORT AN INTERRUPT/
4378  045114  020110  046123  053101
4379  045122  020105  050103  020125
4380  045130  044123  052517  042114
4381  045136  051040  050105  051117
4382  045144  020124  047101  044440
4383  045152  052116  051105  052522
4384  045160  052120     000
4385  045163     012  041415  052520  TM111:  .ASCIZ<12><15>/CPU INTERRUPTED AS EXPECTED/
4386  045170  044440  052116  051105
4387  045176  052522  052120  042105
4388  045204  040440  020123  054105
4389  045212  042520  052103  042105
4390  045220     000
4391  045221     012  050015  053517  $DOWN:  .ASCIZ <12><15>/POWER DOWN TIME WAS UNDER 2 MILISECONDS /
4392  045226  051105  042040  053517
4393  045234  020116  044524  042515
4394  045242  053440  051501  052440
4395  045250  042116  051105  031040
4396  045256  046440  046111  051511
4397  045264  041505  047117  051504
4398  045272  000040
4399  045274  005015  047125  054105  EM1:    .ASCIZ  <CR><LF>/UNEXPECTED POWER FAILURE ON CPU/
4400  045302  042520  052103  042105
4401  045310  050040  053517  051105
4402  045316  043040  044501  052514
4403  045324  042522  047440  020116
4404  045332  050103  000125
4405  045336  005015  047125  054105  EM2:    .ASCIZ  <CR><LF>/UNEXPECTED POWER UP SEQUENCE ON CPU/
4406  045344  042520  052103  042105
4407  045352  050040  053517  051105
4408  045360  052440  020120  042523
4409  045366  052521  047105  042503
4410  045374  047440  020116  050103
4411  045402  000125
4412  045404  005015  046111  042514  EM3:    .ASCIZ  <CR><LF>/ILLEGAL POWER DOWN SEQUENCE ON CPU/
4413  045412  040507  020114  047520
4414  045420  042527  020122  047504
4415  045426  047127  051440  050505
4416  045434  042525  041516  020105
4417  045442  047117  041440  052520
4418  045450     000
4419  045451     015  044412  046114  EM4:    .ASCIZ  <CR><LF>/ILLEGAL POWER UP SEQUENCE/
4420  045456  043505  046101  050040
4421  045464  053517  051105  052440
4422  045472  020120  042523  052521
```

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 4423  045500  047105  042503     000
 4424  045505     015  052412  042516  EM5:    .ASCIZ  <CR><LF>/UNEXPECTED TRAP TO 4/
 4425  045512  050130  041505  042524
 4426  045520  020104  051124  050101
 4427  045526  052040  020117  000064
 4428  045534  005015  047125  054105  EM6:    .ASCIZ  <CR><LF>/UNEXPECTED TRAP TO 10/
 4429  045542  042520  052103  042105
 4430  045550  052040  040522  020120
 4431  045556  047524  030440  000060
 4432  045564  005015  047125  054105  EM7:    .ASCIZ  <CR><LF>/UNEXPECTED TRAP TO 114/
 4433  045572  042520  052103  042105
 4434  045600  052040  040522  020120
 4435  045606  047524  030440  032061
 4436  045614     000
 4437  045615     015  040412  042104  EM10:   .ASCIZ  <CR><LF>/ADDRESS ON STACK IS WRONG/
 4438  045622  042522  051523  047440
 4439  045630  020116  052123  041501
 4440  045636  020113  051511  053440
 4441  045644  047522  043516     000
 4442  045651     015  047412  042114  EM11:   .ASCIZ  <CR><LF>/OLD PS IS WRONG/
 4443  045656  050040  020123  051511
 4444  045664  053440  047522  043516
 4445  045672     000
 4446  045673     015  047412  042104  EM12:   .ASCIZ  <CR><LF>/ODD ADDRESS TRAP FAILED/
 4447  045700  040440  042104  042522
 4448  045706  051523  052040  040522
 4449  045714  020120  040506  046111
 4450  045722  042105     000
 4451  045725     015  046412  046505  EM13:   .ASCIZ  <CR><LF>/MEMORY CORRUPTED ON POWER FAIL/
 4452  045732  051117  020131  047503
 4453  045740  051122  050125  042524
 4454  045746  020104  047117  050040
 4455  045754  053517  051105  043040
 4456  045762  044501  000114
 4457  045766  005015  044524  042515  EM14:   .ASCIZ  <CR><LF>/TIMEOUT TRAP FAILED/
 4458  045774  052517  020124  051124
 4459  046002  050101  043040  044501
 4460  046010  042514  000104
 4461  046014  005015  047520  042527  EM15:   .ASCIZ  <CR><LF>/POWER FAIL RETURNED TOO SOON/
 4462  046022  020122  040506  046111
 4463  046030  051040  052105  051125
 4464  046036  042516  020104  047524
 4465  046044  020117  047523  047117
 4466  046052     000
 4467  046053     015  047012  052117  EM16:   .ASCIZ  <CR><LF>/NOT ENOUGH OR TOO MANY INSTRUCTIONS EXECUTED/
 4468  046060  042440  047516  043525
 4469  046066  020110  051117  052040
 4470  046074  047517  046440  047101
 4471  046102  020131  047111  052123
 4472  046110  052522  052103  047511
 4473  046116  051516  042440  042530
 4474  046124  052503  042524  000104
 4475  046132  005015  047516  046440  EM17:   .ASCIZ  <CR><LF>/NO MEM. MANG. VIOLATION OR TRAP TO 4/
 4476  046140  046505  020056  040515
 4477  046146  043516  020056  044526
 4478  046154  046117  052101  047511
```

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 4479  046162  020116  051117  052040
 4480  046170  040522  020120  047524
 4481  046176  032040     000
 4482  046201     015  047012  020117  EM20:   .ASCIZ  <CR><LF>/NO IIST INTERRUPT/
 4483  046206  044511  052123  044440
 4484  046214  052116  051105  052522
 4485  046222  052120     000
 4486  046225     015  044412  041516  EM21:   .ASCIZ  <CR><LF>?INCORRECT BRK AND/OR DCF FLAGS?
 4487  046232  051117  042522  052103
 4488  046240  041040  045522  040440
 4489  046246  042116  047457  020122
 4490  046254  041504  020106  046106
 4491  046262  043501  000123
 4492  046266  005015  050103  020125  EM22:   .ASCIZ  <CR><LF>/CPU DID NOT TRAP TO VIRTUAL 24/
 4493  046274  044504  020104  047516
 4494  046302  020124  051124  050101
 4495  046310  052040  020117  044526
 4496  046316  052122  040525  020114
 4497  046324  032062     000
 4498  046327     015  041412  042510  EM23:   .ASCIZ  <CR><LF>/CHECKSUM ON MASSBUS TRANSFER IS WRONG/
 4499  046334  045503  052523  020115
 4500  046342  047117  046440  051501
 4501  046350  041123  051525  052040
 4502  046356  040522  051516  042506
 4503  046364  020122  051511  053440
 4504  046372  047522  043516     000
 4505  046377     012  047015  020117  EM24:   .ASCIZ <12><15>/NO POWER FAIL ON CPU/
 4506  046404  047520  042527  020122
 4507  046412  040506  046111  047440
 4508  046420  020116  050103  000125
 4509  046426  006412  047125  054105  EM25:   .ASCIZ <12><15>/UNEXPECTED CPU INTERRUPT/
 4510  046434  042520  052103  042105
 4511  046442  041440  052520  044440
 4512  046450  052116  051105  052522
 4513  046456  052120     000
 4514
 4515  046461     015  044412  051511  DH5:    .ASCIZ  <CR><LF>/IISTID   PC       CPUERR/
 4516  046466  044524  004504  020040
 4517  046474  041520  020040  020040
 4518  046502  020040  041440  052520
 4519  046510  051105  000122
 4520  046514  005015  020040  044511  DH7:    .ASCIZ  <CR><LF>/  IISTID    ERRORPC  CPUERR   MEMERR/
 4521  046522  052123  042111  020040
 4522  046530  020040  051105  047522
 4523  046536  050122  020103  041440
 4524  046544  052520  051105  020122
 4525  046552  020040  042515  042515
 4526  046560  051122     000
 4527  046563     015  052012  051505  DH10:   .ASCIZ  <CR><LF>/TESTNO   ERRORPC/
 4528  046570  047124  020117  020040
 4529  046576  051105  047522  050122
 4530  046604  000103
 4531  046606  005015  042524  052123  DH11:   .ASCIZ  <CR><LF>/TESTNO   ERRORPC     PS/
 4532  046614  047516  020040  042440
 4533  046622  051122  051117  041520
 4534  046630  020040  020040  050040
```

```
4535  046636  000123
4536  046640  006412  042524  052123  DH12:   .ASCIZ<12><15>/TESTNO   ERRORPC   PAGE ADDRESS REGISTER OF BAD MEMORY/
4537  046646  047516  042411  051122
4538  046654  051117  041520  020040
4539  046662  050040  043501  020105
4540  046670  042101  051104  051505
4541  046676  020123  042522  044507
4542  046704  052123  051105  047440
4543  046712  020106  040502  020104
4544  046720  042515  047515  054522
4545  046726     000
4546  046727     015  052012  051505  DH14:   .ASCIZ  <CR><LF>/TESTNO   ERRORPC  CPUERR/
4547  046734  047124  020117  020040
4548  046742  051105  047522  050122
4549  046750  020103  041440  052520
4550  046756  051105  000122
4551  046762  005015  042524  052123  DH20:   .ASCIZ  <CR><LF>/TESTNO    IISTID     ACR     PGTE     PGCS/
4552  046770  047516  020040  020040
4553  046776  044511  052123  042111
4554  047004  020040  020040  040440
4555  047012  051103  020040  020040
4556  047020  050040  052107  020105
4557  047026  020040  020040  043520
4558  047034  051503     000
4559  047037     015  052012  051505  DH21:   .ASCIZ  <CR><LF>/TESTNO    IISTID   FOUND    SHOULD BE/
4560  047044  047124  020117  020040
4561  047052  044440  051511  044524
4562  047060  020104  020040  047506
4563  047066  047125  020104  020040
4564  047074  051440  047510  046125
4565  047102  020104  042502     000
4566  047107     015  052012  051505  DH22:   .ASCIZ  <CR><LF>/TESTNO   IISTID    ERRORPC/
4567  047114  047124  020117  020040
4568  047122  044511  052123  042111
4569  047130  020040  020040  051105
4570  047136  047522  050122  000103
4571                                  .EVEN
4572
4573  047144  014240  014064  014250  DT5:    $REG0,$ERRPC,$REG1,0
4574  047152  000000
4575  047154  014240  014064  014250  DT7:    $REG0,$ERRPC,$REG1,$REG2,0
4576  047162  014260  000000
4577  047166  014002  014064  000000  DT10:   $TSTNM,$ERRPC,0
4578  047174  014002  014064  014240  DT11:   $TSTNM,$ERRPC,$REG0,0
4579  047202  000000
4580  047204  014002  014064  014250  DT12:   $TSTNM,$ERRPC,$REG1,0
4581  047212  000000
4582  047214  014002  014240  014250  DT20:   $TSTNM,$REG0,$REG1,$REG2,$REG3,0
4583  047222  014260  014270  000000
4584  047230  014002  014240  014250  DT21:   $TSTNM,$REG0,$REG1,$REG2,0
4585  047236  014260  000000
4586  047242  014002  014240  014064  DT22:   $TSTNM,$REG0,$ERRPC,0
4587  047250  000000
4588  047252  005015  020133  045517  OK:     .ASCIZ  <CR><LF>/[ OK ]  /
4589  047260  056440  020040     000
4590          047266                        .EVEN
```

```
4591  047266  001000                  ERRBUF: .BLKW   1000            ;ERROR ASCII MSG STORAGE AREA
4592  051266  020000                  DSKBUF: .BLKW   20000           ;MASSBUS BUFFER AREA
4593  111266  000000                  END:    0
4594
4595          000001                  .END
```

```
A       024540          1871    1877#
ABASE = 000000           735     776
ACDW1 = 000000           735     778
ACDW2 = 000000           735     779
ACPUOP= 000000           735     750
ACR     017030           882#   1128*  1131*  1134   1144*  1165*  1171*  1174*  1178*  1218   1221*  1222*  1239*
                        1243*  1247*  1255*  1265*  1828*  1834   1922*  1990*  1993*  1999   2000*  2010*  2047*
                        2129*  2296*  2347*  2405*  2458*  2509*  2567*  2619*  2670*  2728*  2916   2927*  3154
                        3834
ADDW0 = 000000           735     780
ADDW1 = 000000           735     781
ADDW10= 000000           735     790
ADDW11= 000000           735     791
ADDW12= 000000           735     792
ADDW13= 000000           735     793
ADDW14= 000000           735     794
ADDW15= 000000           735     795
ADDW2 = 000000           735     782
ADDW3 = 000000           735     783
ADDW4 = 000000           735     784
ADDW5 = 000000           735     785
ADDW6 = 000000           735     786
ADDW7 = 000000           735     787
ADDW8 = 000000           735     788
ADDW9 = 000000           735     789
ADEVCT= 000000           735     741
ADEVM = 000000           735     777
ADR     017032           883#   1132   1145   1166*  1167*  1172   1175*  1176*  1179   1223*  1258*  1261*  1263*
                        1991*  1994   2001   2002   2017   2406*  2409*  2411*  2568*  2571*  2573*  2729*  2732*
                        2734*
AENV  = 000000           735     746
AENVM = 000000           735     747
AFATAL= 000000           735     738
AMADR1= 000000           735     763
AMADR2= 000000           735     767
AMADR3= 000000           735     770
AMADR4= 000000           735     773
AMAMS1= 000000           735     757
AMAMS2= 000000           735     765
AMAMS3= 000000           735     768
AMAMS4= 000000           735     771
AMSGAD= 000000           735     743
AMSGLG= 000000           735     744
AMSGTY= 000000           735     737
AMTYP1= 000000           735     758
AMTYP2= 000000           735     766
AMTYP3= 000000           735     769
AMTYP4= 000000           735     772
APASS = 000000           735     740
APRIOR= 000000           735
APTCSU= 000040          3648#
APTENV= 000001          3518    3604    3646#
APTSIZ= 000200          1079    3645#
APTSPD= 000100          3606    3647#
ASWREG= 000000           735     748
ATESTN= 000000           735     739
```

```
AUNIT = 000000          735     742
AUSWR = 000000          735     749
AVECT1= 000000          735     774
AVECT2= 000000          735     775
BAD     025160         1966    1974#   1989
BEGIN   021450         1250    1266#
BFADR   017042          887#    2203    2208    2212    2218    2239    2244    2252    2257
BIT0  = 000001.         198#     502    1093    1152    1154    1167    1176    1259    2407    2569    2730    2984
BIT00 = 000001          188#     198
BIT01 = 000002          187#     197
BIT02 = 000004          186#     196
BIT03 = 000010          185#     195
BIT04 = 000020          184#     194    2968
BIT05 = 000040          183#     193
BIT06 = 000100          182#     192
BIT07 = 000200          181#     191
BIT08 = 000400          180#     190
BIT09 = 001000          179#     189    3450
BIT1  = 000002          197#     503
BIT10 = 002000          178#     543
BIT11 = 004000          177#     542    1132    1172    1179
BIT12 = 010000          176#     541
BIT13 = 020000          175#
BIT14 = 040000          174#     513    1853    3434
BIT15 = 100000          173#     514    1128    1221    1239    1243    1247    1265    1828    1922    2047    2129    2296
                       2347    2458    2509    2619    2670    2927
BIT2  = 000004          196#     504    1223    1991
BIT3  = 000010          195#     505
BIT4  = 000020          194#     549    1327    1371    1401    1436    1472    1478    1502    1510    1541    1548    1572
                       1579    1590    1616    1640    1648    1670    1678    1700    1708    1730    1738    1764    1770
                       3028
BIT5  = 000040          193#     511     548    1849
BIT6  = 000100          192#     510     547    3004
BIT7  = 000200          191#     546    2976    2982    2995    3007
BIT8  = 000400          190#     545    1860    3878
BIT9  = 001000          189#     512     544    1189    1213    1856    1879    1886    2915    3510
BMSK    017040          886#    1052*   1166    1186*
BOOT    014526          808#    2341*   2365    2386    2503*   2527    2548    2664*   2688    2709    2858
BOXNUM  014646          835#    2363    2525    2686    2803*   2819*   2831
BPTVEC= 000014          205#
BUFCLR  032566         2378    2540    2701    2840#   2843
CACHVE= 000114          213#    1305*
CKSUM   014650          836#    1361*   1362*   1363*   1382    2206*   2209*   2210*   2222    2242*   2245*   2246*   2261
CONTRL= 177746          222#    1189*   1203*   1213*   2915*   3039    3099*   3114*   3115*   3183    3243*
COUNT0  016754          862#    3055*   3064*   3066    3126    3200*   3209*   3211
COUNT1  016756          863#    3069*   3070    3214*   3215
COUNT2  016760          864#    3073*   3074    3218*   3219
COUNT3  016762          865#    3077*   3078    3222*   3223
CPUACT  016774          870#    1043    1127*   1177*   1191    1259    1822    1896    1925    1928    2050    2053    2090
                       2132    2135    2159    2169    2288    2407    2450    2569    2611    2730    2795    3303    3395
                       3399*
CPUER   040630         1086    1092    1098    1481    1515    1552    1583    1652    1682    1712    1742    1776    1850
                       2300    2351    2462    2513    2623    2674    2830    2865    2887    3972#
CPUERR= 177766          234#    2947    3973
CPULS1  016770          868#    1191*   1192*   1983    2005    2028    2101
CP0   = 000001          502#
```

```
CP1    = 000002          503#
CP2    = 000004          504#
CP3    = 000010          505#
CR     = 000015          110#  3881  3978  3983  3987  3993  4000  4007  4018  4025  4034  4045  4058
                        4064  4069  4080  4084  4091  4096  4102  4152  4399  4405  4412  4419  4424
                        4428  4432  4437  4442  4446  4451  4457  4461  4467  4475  4482  4486  4492
                        4498  4515  4520  4527  4531  4546  4551  4559  4566  4588
CRLF   = 000200          111#
C1       016722          850#  1947
C2       016724          851#  1948
C3       017004          874#  1949
DCF    = 000007          490#  1144  1993  2010
DDISP  = 177570          104#   686   687   688   689
DH10     046563          912    954   966   984   990  1026  1032  4527#
DH11     046606          960   4531#
DH12     046640          972   4536#
DH14     046727          978    996  4546#
DH20     046762         1002   4551#
DH21     047037         1008   4559#
DH22     047107         1014   1020  4566#
DH5      046461          936    942  4515#
DH7      046514          948   4520#
DIGITS   037640         3689*  3690*  3691*  3692  3693*  3707  3709*  3724*  3737#
DISPLA   014170          686#  1088*  1303*  1357*  1393*  1428*  1463*  1492*  1532*  1561*  1607*  1631*  1661*
                        1691*  1721*  1751*  1779*  1917*  2043*  2125*  2281*  2297*  2348*  2443*  2459*  2510*
                        2604*  2620*  2671*  2766*  3465*  3488*
DISPRE   000174          557#  1088
DSKBUF   051266          887   4592#
DSWR   = 177570          103#   682   683   684   685
DT10     047166          913    955   967   985   991  1027  1033  4577#
DT11     047174          961    979   997  4578#
DT12     047204          973   4580#
DT20     047214         1003   4582#
DT21     047230         1009   4584#
DT22     047242         1015   1021  4586#
DT5      047144          937    943  4573#
DT7      047154          949   4575#
D1       016726          852#  2071  2090
D2       016730          853#  2072
D3       017006          875#  2073
EMTVEC=  000030          208#  1063*  1064*
EM1      045274          911   4399#
EM10     045615          953   4437#
EM11     045651          959   4442#
EM12     045673          965   4446#
EM13     045725          971   4451#
EM14     045766          977   4457#
EM15     046014          983   4461#
EM16     046053          989   4467#
EM17     046132          995   4475#
EM2      045336          917   4405#
EM20     046201         1001   4482#
EM21     046225         1007   4486#
EM22     046266         1013   4492#
EM23     046327         1019   4498#
EM24     046377         1025   4505#
```

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EM25    046426          1031    4509#
EM3     045404           923    4412#
EM4     045451           929    4419#
EM5     045505           935    4424#
EM6     045534           941    4428#
EM7     045564           947    4432#
END     111266          3718    4593#
ENTR    033226          2392    2554    2715    2915#
ENTR22  014542           814#   2286*   2288
ENTR23  014544           815#   2448*   2450
ENTR24  014546           816#   2609*   2611
EOPLID  036226          3333    3342    3351    3360    3409#
ERRBUF  047266          3716    3720    4591#
ERRDIS  040624          1085    1091    1097    3970#
ERRLCK  017002           873#   3532*   3576*   3822
ERRTAB  014702           843#   1086*   1092*   1098*   1465*   1481*   1494*   1515*   1534*   1552*   1564*   1583*   1633*
                        1652*   1663*   1682*   1693*   1712*   1723*   1742*   1754*   1776*   1847*   1850*   2300*   2351*
                        2462*   2513*   2623*   2674*   2805*   2830*   2865*   2887*   3970
ERRVEC= 000004           201#   1069*   1085*   1091*   1097*   3439    3440*   3442*   3445*
EXC   = 000010           491#
EXIT    014540           813#   2290*   2302    2343    2356*   2452*   2464    2505    2518*   2613*   2625    2666    2679*
                        2836*
EXTRA   016772           869#   1049
E1      016732           854#   2154    2159
E2      016734           855#   2155
E3      017010           876#   2156
FACTOR  017066           893#
FIRST   017036           885#   1051*
FLAG    014602           825#   1563*   1584    3967*   3968*
FLAGB   016736           856#   3396    3398*
FORKTB  021252          1228    1233#
GNS   = ****** U         556    3316    3323    3330    3339    3348    3357    3366    3571    3957    3958    3959    3960
                        3961
HERE    040300          3869#   3902
HIADRS= 177742           220#
HIBOX   014550           817#   2309    2310    2311    2371    2372    2373    2471    2472    2473    2533    2534    2535
                        2632    2633    2634    2694    2695    2696    2822*   2888    2890    2893    3149    3150    3151
HICORE  014532           810#   2369*   2427*   2531*   2589*   2692*   2750*   3137
HITMIS= 177752           224#
HOE   = 100000           514#
HT    = 000011           108#
ILLDN   035322          3227    3265#
ILLDWN  034442          3083    3121#
ILLUP   034436          3025    3118#
IMSK  = 000004           487#
INTMSK  017000           872#   1175    1187*
IOTVEC= 000020           206#
ISTDIS  040602          1898    3965#
ISTTAB  014672           841#   1966*   1989*   1995*   3965
ISTVEC  017034           884#   1147*   1251    1253*   1898*   2392*   2554*   2715*
KDPAR0= 172360           376#
KDPAR1= 172362           377#
KDPAR2= 172364           378#
KDPAR3= 172366           379#
KDPAR4= 172370           380#
KDPAR5= 172372           381#
```

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KDPAR6= 172374          382#
KDPAR7= 172376          383#    3043    3094    3187    3238
KDPDR0= 172320          354#
KDPDR1= 172322          355#
KDPDR2= 172324          356#
KDPDR3= 172326          357#
KDPDR4= 172330          358#
KDPDR5= 172332          359#
KDPDR6= 172334          360#
KDPDR7= 172336          361#
KERSTK= 013776           94#
KIPAR0= 172340          365#    2309*   2371*   2471*   2533*   2632*   2694*   2846*   2956*   3139*   3149*
KIPAR1= 172342          366#    2310*   2372*   2472*   2534*   2633*   2695*   2848*   2958*   3141*   3150*
KIPAR2= 172344          367#    2311*   2373*   2473*   2535*   2634*   2696*   2850*   2960*   3143*   3151*
KIPAR3= 172346          368#    2863*   2868    2875    2880*   2888*   2905*
KIPAR4= 172350          369#    2890*   2891*   2906*
KIPAR5= 172352          370#    2893*   2894*   2907*   2962*
KIPAR6= 172354          371#    2964*
KIPAR7= 172356          372#    2852*   2966*   3145*
KIPDR0= 172300          343#    2847*   2957*   3140*
KIPDR1= 172302          344#    2849*   2959*   3142*
KIPDR2= 172304          345#    2851*   2961*   3144*
KIPDR3= 172306          346#    2864*   2889*
KIPDR4= 172310          347#    2892*
KIPDR5= 172312          348#    2895*   2963*
KIPDR6= 172314          349#    2965*
KIPDR7= 172316          350#    2853*   2967*   3146*
LF    = 000012          109#    3883    3978    3983    3987    3993    4000    4007    4018    4025    4034    4045    4058
                       4064    4069    4080    4084    4091    4096    4102    4152    4399    4405    4412    4419    4424
                       4428    4432    4437    4442    4446    4451    4457    4461    4467    4475    4482    4486    4492
                       4498    4515    4520    4527    4531    4546    4551    4559    4566    4588
LKS   = 177546          105#    3004*   3007*   3011*
LKVEC = 000100          212#
LOADRS= 177740          219#
LOE   = 001000          512#
LOG1    016764          866#    1982*   1983    1987*   2100*   2101    2105*
LOG2    016766          867#    2004*   2005    2007*   2027*   2028    2032*
LOOPS   016752          861#    3062*   3066    3070    3074    3078    3126    3207*   3211    3215    3219    3223
LOT   = 040000          513#
MAINT = 177750          223#
MAP     033406         1755    2956#
MAPH0 = 170202          459#
MAPH00= 170202          395#    459
MAPH01= 170206          397#    461
MAPH02= 170212          399#    463
MAPH03= 170216          401#    465
MAPH04= 170222          403#    467
MAPH05= 170226          405#    469
MAPH06= 170232          407#    471
MAPH07= 170236          409#    473
MAPH1 = 170206          461#
MAPH10= 170242          411#
MAPH11= 170246          413#
MAPH12= 170252          415#
MAPH13= 170256          417#
MAPH14= 170262          419#
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MAPH15= 170266           421#
MAPH16= 170272           423#
MAPH17= 170276           425#
MAPH2 = 170212           463#
MAPH20= 170302           427#
MAPH21= 170306           429#
MAPH22= 170312           431#
MAPH23= 170316           433#
MAPH24= 170320           435#
MAPH25= 170326           437#
MAPH26= 170332           439#
MAPH27= 170336           441#
MAPH3 = 170216           465#
MAPH30= 170342           443#
MAPH31= 170346           445#
MAPH32= 170352           447#
MAPH33= 170356           449#
MAPH34= 170362           451#
MAPH35= 170366           453#
MAPH36= 170372           455#
MAPH37= 170376           457#   3047    3090    3191    3234
MAPH4 = 170222           467#
MAPH5 = 170226           469#
MAPH6 = 170232           471#
MAPH7 = 170236           473#
MAPL0 = 170200           458#
MAPL00= 170200           394#   458     3045    3092    3189    3236
MAPL01= 170204           396#   460
MAPL02= 170210           398#   462
MAPL03= 170214           400#   464
MAPL04= 170220           402#   466
MAPL05= 170224           404#   468
MAPL06= 170230           406#   470
MAPL07= 170234           408#   472
MAPL1 = 170204           460#
MAPL10= 170240           410#
MAPL11= 170244           412#
MAPL12= 170250           414#
MAPL13= 170254           416#
MAPL14= 170260           418#
MAPL15= 170264           420#
MAPL16= 170270           422#
MAPL17= 170274           424#
MAPL2 = 170210           462#
MAPL20= 170300           426#
MAPL21= 170304           428#
MAPL22= 170310           430#
MAPL23= 170314           432#
MAPL24= 170320           434#
MAPL25= 170324           436#
MAPL26= 170330           438#
MAPL27= 170334           440#
MAPL3 = 170214           464#
MAPL30= 170340           442#
MAPL31= 170344           444#
MAPL32= 170350           446#
```

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MAPL33= 170354          448#
MAPL34= 170360          450#
MAPL35= 170364          452#
MAPL36= 170370          454#
MAPL37= 170374          456#
MAPL4 = 170220          466#
MAPL5 = 170224          468#
MAPL6 = 170230          470#
MAPL7 = 170234          472#
MBDSW   014632          831#  1862*  1865*  1875*  1885*  1886*  2174   2198   2231   2978
MBUSR   033540         2205   2214   2241   2254   2975#
MEMERR= 177744          221#  2948   2951*
MEMSIZ  032342         2342   2504   2665   2801#
MMERR   033534         2855   2969   2971#  2972   2985*  2986*  2987*  2988*  2989*  2990*  2991*  2992*  2993*
                       2994*  3148
MMR0  = 177572          244#   248   1758*  1774*  2304*  2312*  2317*  2374*  2422   2426*  2466*  2474*  2479*
                       2536*  2584   2588*  2627*  2635*  2640*  2697*  2745   2749*  2866*  2883*  2898*  2902*
                       3034   3103   3152*  3178   3247
MMR1  = 177574          245#   249
MMR2  = 177576          246#   250
MMR3  = 172516          247#   251   2854*  2968*  3040   3098*  3147*  3184   3242*
MMVEC = 000250          215#  1756*  2855*  2969*  3148*
MPF     016737          857#  1093*  1099*  1122   1249   1780   3112   3290   3325   3830
MPSW  = 000100          510#  1082   1089
MSTENT  021224         1211   1225#
MSO     021342         1233   1249#
MTC   = 000015          492#
NCX   = 010000          541#  1965   2088   2194
NODEV   044147         2179   4290#
NOPRMP  017012          877#  2023*  2325*  2418*  2487*  2580*  2648*  2741*  2932*  3535*  3837   3840*
NORH70  024516         1872#  1902
NORP    024664         1847   1901#
NS    = 002000          543#
NXTDRV  024500         1854   1859   1861   1867#
OK      047252         2401   2563   2724   4588#
PARERR  033340         1305   2943#
PARFLG  033342         1306*  2944#  2952*
PATCHK  014530          809#  2376*  2420*  2538*  2582*  2699*  2743*  2870
PATTRN  032700         2377   2421   2539   2583   2700   2744   2858#
PFDT    014622          829#
PFFT    014612          827#  1753*  1965*  2088*  2194*  2299*  2350*  2461*  2512*  2622*  2673*  2787*  3169
                       3251
PGCS  = 000001          484#  1171   1178   1222   1990
PGF   = 000005          488#
PGTE  = 000000          483#  1165   1255   2000   2405   2567   2728
PIRQ  = 177772          102#
PIRQVE= 000240          214#
POWDWN  033774         1304   1513   1593   3025#  3107
POWUP   034256         3061   3082#
PR0   = 000000          135#
PR1   = 000040          136#
PR2   = 000100          137#
PR3   = 000140          138#
PR4   = 000200          139#
PR5   = 000240          140#
PR6   = 000300          141#
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PR7    = 000340          142#
PS     = 177776           99#   100   1320*  1330*  1358*  1394*  1404*  1429*  1439*  1464*  1493*  1504*  1533*
                         1544*  1562*  1574*  1608*  1632*  1643*  1645*  1662*  1673*  1675*  1692*  1703*  1705*
                         1722*  1733*  1735*  1752*  3006*
PSW    = 177776          100#  1224*  2291*  2453*  2614*  3038   3100*  3182   3244*
PUT      017062          891#  1053*  1952*  2011   2075*  2158*
PWRDIS   040606         1067   1307   1521   3967#
PWRFL    014522          806#  2321   2340*  2397   2414   2483   2502*  2559   2576   2644   2663*  2720   2737
                        2833
PWRTAB   014662          839#  1304*  1506*  1513*  1586*  1593*  1846*  2929*  3025*  3061*  3083*  3107*  3165
                        3168*  3201*  3227*  3255*  3969
PWRVEC=  000024          207#  1067*  1068*  1307*  1308*
P21      026432         2187   2190#
RELODN   014536          812#  2315   2318*  2425*  2477   2480*  2587*  2638   2641*  2748*
RELOHI   033042         2367   2529   2690   2886#
RELOLO   033166         2424   2586   2747   2905#
RELOUP   014534          811#  2306   2313*  2370*  2468   2475*  2532*  2629   2636*  2693*
RESTAB   037064         3299   3406   3579#
RESTRT   020000          577   1042#  3397
RESVEC=  000010          202#
ROUTE    014562          820#  3937*  3939
RPAS   = 176716          526#
RPBA   = 176704          521#  2980*
RPCC   = 176736          534#
RPCS1  = 176700          519#  2204*  2213*  2240*  2253*  2976   2984*  2997
RPCS2  = 176710          523#  1849*  1852*  1863   1878*  2978*
RPDA   = 176706          522#  2981*
RPDB   = 176722          528#
RPDC   = 176734          533#
RPDS   = 176712          524#  1853   1856   1860   1879   2982   2995
RPDT   = 176726          530#
RPEC1  = 176744          537#
RPEC2  = 176746          538#
RPER1  = 176714          525#
RPER2  = 176740          535#
RPER3  = 176742          536#
RPLA   = 176720          527#
RPMR   = 176724          529#
RPOF   = 176732          532#
RPPGM    016742          859#  1858*  1870
RPSN   = 176730          531#
RPSRC    024414         1852#  1869
RPWC   = 176702          520#  2979*
SAVRG    014552          818#  3931*  3938
SAV6     014572          823#  3054*  3084   3199*  3228
SDPAR0=  172260          332#
SDPAR1=  172262          333#
SDPAR2=  172264          334#
SDPAR3=  172266          335#
SDPAR4=  172270          336#
SDPAR5=  172272          337#
SDPAR6=  172274          338#
SDPAR7=  172276          339#
SDPDR0=  172220          310#
SDPDR1=  172222          311#
SDPDR2=  172224          312#
```

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SDPDR3= 172226          313#
SDPDR4= 172230          314#
SDPDR5= 172232          315#
SDPDR6= 172234          316#
SDPDR7= 172236          317#
SEC2    024220         1311    1817#   1819
SED   = 000200          546#
SETCLK  033704         3002#
SETMM   032604         2308    2470    2631    2846#   2862    2886
SEU   = 000100          547#
SID   = 001000          544#
SIGNAL  014642          833#   1938*   1968*   1996*   1998*   2092*   2113*   2115*   2196*   2225*   2227*   2264*   2266*
                       3171*   3253*
SIPAR0= 172240          321#
SIPAR1= 172242          322#
SIPAR2= 172244          323#
SIPAR3= 172246          324#
SIPAR4= 172250          325#
SIPAR5= 172252          326#
SIPAR6= 172254          327#
SIPAR7= 172256          328#
SIPDR0= 172200          299#   3041    3096    3185    3240
SIPDR1= 172202          300#
SIPDR2= 172204          301#
SIPDR3= 172206          302#
SIPDR4= 172210          303#
SIPDR5= 172212          304#
SIPDR6= 172214          305#
SIPDR7= 172216          306#
SIU   = 000400          545#
SIZEHI= 177762          231#
SIZELO= 177760          229#
SIZEND  024630         1866    1876    1894#
SIZMBS  024370         1847#
SLVENT  021140         1147    1212#
SLVID   014644          834#   1214*   1215
SL1     021262         1234    1237#
SL2     021302         1235    1241#
SL3     021322         1236    1245#
SR0   = 177572          248#
SR1   = 177574          249#
SR2   = 177576          250#
SR3   = 172516          251#
SSD   = 000040          548#   3169
SSU   = 000020          549#   1965    2088    2194    3251
STACK = 013776           93#     94      95      96     690     691     692     693
START   014502          803#   2358    2520    2681   2810*   2811*   2812   2814*   2818    2820    2822   2824*   2860
                       2863
STCS  = 000003          486#
STF   = 000006          489#
STKLMT= 177774          101#
STOP    014462          800#   1047   2807*   2808*   2809*   2815   2817*   2818*   2868
STRT    020064          575     578    1057#
STS17   025376         1995   2009#
STTE  = 000002          485#
ST0     021076         1124   1203#
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SUPSTK= 013576          95#
SWR     014160         682#  1078*  1081*  1082   1087*  1089   1103   1104   1109   1113   1115   1126   1206
                      1256   1309   1349   1387   1420   1454   1482   1524   1553   1599   1623   1653   1683
                      1713   1743   1777   2403   2565   2726   2768   3434   3450   3495   3510
SWREG   000176        558#
SW0   = 000001        170#
SW00  = 000001        160#   170
SW01  = 000002        159#   169
SW02  = 000004        158#   168
SW03  = 000010        157#   167
SW04  = 000020        156#   166
SW05  = 000040        155#   165
SW06  = 000100        154#   164
SW07  = 000200        153#   163   1115   1309
SW08  = 000400        152#   162   2768
SW09  = 001000        151#   161
SW1   = 000002        169#
SW10  = 002000        150#
SW11  = 004000        149#
SW12  = 010000        148#
SW13  = 020000        147#
SW14  = 040000        146#   1349   1387   1420   1454   1482   1524   1553   1599   1623   1653   1683   1713
                      1743   1777
SW15  = 100000        145#
SW2   = 000004        168#
SW3   = 000010        167#
SW4   = 000020        166#
SW5   = 000040        165#
SW6   = 000100        164#
SW7   = 000200        163#
SW8   = 000400        162#
SW9   = 001000        161#
SYNC.1  014712         845#  2025*  2030*  2145*  2195*  2248*  2250*  3254*
SYNC.2  014714         846#  1939*  1969*  1980*  1985*  2063*  2093*  2098*  2103*  2146*  2184*  2201*  2228*
                      2233*  2235*  2789*  2793*  2795
SYNC.3  016776         871#  1818*  1821*  2284*  2287*  2446*  2449*  2607*  2610*  2791*  2794*  3288*  3295*
                      3302*
SYSTID= 177764         233#
S2LOG1  016716         848#  1820*  1822
S2LOG2  016720         849#  1895*  1896
S2L1    017026         881#  1045   1830*  1894*
TBITVE= 000014         203#
TI    = 004000         542#  1753   1965   2088   2194   2787
TIMIT   034446        3106   3125#  3250
TKVEC = 000060         210#
TM1     040644        1076   3978#
TM10    041143        4013#
TM100   041724        1961   2084   2190   4080#
TM101   041750        1872   4084#
TM102   042021        2183   4091#
TM103   042052        2326   2419   2488   2581   2649   2742   4096#
TM104   042115        2786   4102#
TM106   042534        2379   2541   2702   4152#
TM107   042600        2546   4158#
TM108   043226        2384   4208#
TM109   044206        2835   4296#
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TM11    041176          1158    4018#
TM110   044270          2707    4305#
TM111   045163          2024    2933    4385#
TM12    041207          1161    4020#
TM13    041241          1317    4025#
TM14    041605          1314    4064#
TM15    041635          1826    4069#
TM2     040676          1108    3983#
TM4     040723          1117    3987#
TM5     040765          1120    3993#
TM6     041033          1102    4000#
TM7     041100          1100    4007#
TM76    041665          1136    4074#
TM77    041713          1955    2078    2163    2334    2496    2657    2779    4078#
TPVEC = 000064           211#
TQL1    017024           880#   3841*   3857*   3867*   3907*
TRAPVE= 000034           209#   1065*   1066*
TRTVEC= 000014           204#
TST1    021450          1229    1230    1231    1232    1240    1244    1248    1302#   1350    3579    3580    3581    3582
TST10   022762          1560#   1600
TST11   023160          1606#   1624
TST12   023252          1630#   1654
TST13   023406          1660#   1684
TST14   023542          1690#   1714
TST15   023676          1720#   1744
TST16   024032          1750#   1778
TST17   024674          1899    1916#   1971    1976    2008    2033
TST2    021704          1356#   1388
TST20   025524          1934    2042#   2095    2116
TST21   026114          2059    2124#   2185    2202    2229    2237    2268
TST22   027076          2141    2280#
TST23   030120          2305    2345    2357    2442#
TST24   031142          2467    2507    2519    2603#
TST25   032164          2628    2668    2680    2765#
TST3    022044          1392#   1421
TST4    022176          1427#   1455
TST5    022330          1462#   1483
TST6    022444          1491#   1525
TST7    022636          1531#   1554
TS17A   025050          1943    1951#
TS17B   025172          1945    1979#   1981
TS20A   025674          2067    2074#
TS20B   026006          2069    2097#   2099
TS21A   026270          2150    2157#
TS21B   026656          2152    2230#
TS22A   027352          2294    2331#
TS22B   027162          2293    2296#   2314    2316    2319    2324    2327
TS23A   030374          2456    2493#
TS23B   030204          2455    2458#   2476    2478    2481    2486    2489
TS24A   031416          2617    2654#
TS24B   031226          2616    2619#   2637    2639    2642    2647    2650    2934
TS25A   032232          2774    2776#
TS25B   032264          2775    2787#
TYPDS = 104405          1138    1160    1874    1889    1892    1963    2086    2181    2192    2382    2544    2705    3320
                        3335    3344    3353    3362    3370    3961#
TYPE  = 104401           1#     1076    1100    1102    1108    1111    1112    1117    1120    1136    1157    1158    1161
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                    1314    1317    1318    1826    1872    1887    1890    1893    1955    1961    1964    1988    2024
                    2078    2084    2087    2106    2163    2179    2182    2183    2190    2193    2236    2251    2267
                    2326    2334    2379    2384    2401    2419    2488    2496    2541    2546    2563    2581    2649
                    2657    2702    2707    2724    2742    2779    2785    2786    2797    2835    2933    3128    3314
                    3321    3327    3328    3336    3337    3345    3346    3354    3355    3363    3364    3371    3499
                    3541    3543    3548    3550    3569    3574    3715    3801    3957#
TYPIT   040504      3882    3884    3886    3888    3890    3903    3915#   3916
TYPLCK  017064       892#   1054*   3534*   3575*   3824
TYPOC = 104402      1110    3567    3958#
TYPON = 104404      3960#
TYPOS = 104403      1958    2081    2166    2337    2499    2660    2782    3959#
TYPQUE  014716       847#   1070*   1071*   3392    3393    3401*   3402*   3844    3847*   3851    3854*   3871    3873
                    3876*   3893    3895    3898*   3905*   3906*
UBCR2 = 170016       474#   1327*   1371*   1401*   1436*   1472*   1478*   1502*   1510*   1541*   1548*   1572*   1579*
                    1590*   1616*   1640*   1648*   1670*   1678*   1700*   1708*   1730*   1738*   1764*   1770*   3028*
UBEF    016740       858#   1118*   1121*   1315    1322    1340    1366    1396    1410    1431    1445    1467    1476
                    1497    1508    1536    1546    1567    1577    1588    1611    1635    1646    1665    1676    1695
                    1706    1725    1736    1759    1768    3026    3108    3394    3400*
UBELCK  017022       879#   1324*   1368*   1398*   1433*   1469*   1499*   1538*   1569*   1613*   1637*   1667*   1697*
                    1727*   1761*   3110*
UBESW = 000040       511#   1113
UDPAR0= 177660       288#
UDPAR1= 177662       289#
UDPAR2= 177664       290#
UDPAR3= 177666       291#
UDPAR4= 177670       292#
UDPAR5= 177672       293#
UDPAR6= 177674       294#
UDPAR7= 177676       295#   3036    3101    3180    3245
UDPDR0= 177620       266#
UDPDR1= 177622       267#
UDPDR2= 177624       268#
UDPDR3= 177626       269#
UDPDR4= 177630       270#
UDPDR5= 177632       271#
UDPDR6= 177634       272#
UDPDR7= 177636       273#
UIPAR0= 177640       277#
UIPAR1= 177642       278#
UIPAR2= 177644       279#
UIPAR3= 177646       280#
UIPAR4= 177650       281#
UIPAR5= 177652       282#
UIPAR6= 177654       283#
UIPAR7= 177656       284#
UIPDR0= 177600       255#
UIPDR1= 177602       256#
UIPDR2= 177604       257#
UIPDR3= 177606       258#
UIPDR4= 177610       259#
UIPDR5= 177612       260#
UIPDR6= 177614       261#
UIPDR7= 177616       262#
UNIEOP  036032      3326    3368#
USESTK= 013476        96#
WAIT  = ****** U    3305
```

```
YELLIM  017052          889#  3174
YYY     014524          807#  3558*  3561*  3562   3565*  3566
$AFRK = 000000            1#
$APTHD  000230          593   599#
$ASTAT= ****** U       3626  3641
$ATYC   037120          3597  3599#
$ATY1   037074          3595#
$ATY3   037102          3596#
$ATY4   037112          3521  3598#
$AUTOB  014154          679#
$BASE   014412          776#
$BDADR  014114          660#
$BDDAT  014140          673#
$CDW1   014416          778#
$CDW2   014420          779#
$CKSWR= ****** U       3964
$CMTAG  014000          613#  1204
$CM1  = 000005          709#  711#  713#  715#  717#  719#
$CM2  = 000012          709#  711#  713#  715#  717#  719#
$CM3  = 000005          707#  709
$CM4  = 000005          719#  720#  721#  722#  723#  724#
$CPUID  014226          703#  1058  1139*  1162  1220*  1838  1873  1891  1962  2012  2085  2180  2191
                        2919  3157  3411
$CPUOP  014364          750#
$CRLF   014333          729#  1111  1112  1157  1318  1964  2087  2182  2193  2785  3327  3336  3345
                        3354  3363  3371  3543  3550  3574
$DBLK   040062          3766  3801  3810#
$DDW0   014422          780#
$DDW1   014424          781#
$DDW10  014446          790#
$DDW11  014450          791#
$DDW12  014452          792#
$DDW13  014454          793#
$DDW14  014456          794#
$DDW15  014460          795#
$DDW2   014426          782#
$DDW3   014430          783#
$DDW4   014432          784#
$DDW5   014434          785#
$DDW6   014436          786#
$DDW7   014440          787#
$DDW8   014442          788#
$DDW9   014444          789#
$DEVCT  014346          741#
$DEVM   014414          777#
$DOAGN  036122          3310  3382  3385  3391#
$DOWN   045221          3128  4391#
$DTBL   040052          3769  3806#
$ENDAD  036112           565  3387#  3526
$ENDCT  035446          1209  3312#
$ENULL  036222          3407#
$ENV    014356           746#  3518  3604  3628
$ENVM   014357           747#  1079  3606  3817
$EOP    035326          1782  2770  2798  3287#  3289
$EOPCT  035434          1209*  3308#  3313
$EOPSG  014134           668#  3294*  3296  3301*  3303  3404*
```

```
$ERFLG  014006          619#  3427  3448  3455*  3468  3486*
$ERGBL  014224          702#  3369  3372*  3490*
$ERMAX  014060          644#  3464*  3468
$ERROR  036432         1063   3485#
$ERRPC  014064          648#  3491*  3492*  3493  4573  4575  4577  4578  4580  4586
$ERRSP  014074          652#  3494*
$ERRTB  017070          909#  3539
$ERRTY  036652         3530#
$ERTTL  014042          635#  3334  3343  3352  3361  3373  3489*
$ESCAP  014322          724#  1226*  3463*  3513  3515
$ETABL  014356          745#
$ETEND  014462          605   798#
$FATAL  014340          738#  3632*
$FFLG   037340         3595*  3598*  3626  3635*  3643#
$FILLC  014222          700#
$FILLS  014221          699#
$GDADR  014104          656#
$GDDAT  014124          664#
$GET    036102         3380   3384#
$GET42  036072         3381#
$GTSWR= ****** U       3963
$HD   = 000000           11
$HIBTS  000230          600#
$ICNT   014012          623#
$ILLUP  035316         3168   3261#
$INTAG  014155          680#
$ITEMB  014054          640#  3493*  3520  3536
$LF     014334          730#
$LFLG   037337         3636*  3642#
$LPADR  014022          627#  3453*  3461*  3466  3468
$LPERR  014032          631#  1227*  3453  3462*  3468  3512
$MADR1  014370          763#
$MADR2  014374          767#
$MADR3  014400          770#
$MADR4  014404          773#
$MAIL   014336          601   605   736#  3457
$MAMS1  014366          757#
$MAMS2  014372          765#
$MAMS3  014376          768#
$MAMS4  014402          771#
$MBADR  000232          601#
$MFLG   037336         3596*  3602  3637*  3641#
$MSGAD  014352          743#  3612*  3615
$MSGLG  014354          744#  3617*
$MSGTY  014336          737#  3610  3618*  3630  3634*
$MTYP1  014367          758#
$MTYP2  014373          766#
$MTYP3  014377          769#
$MTYP4  014403          772#
$NULL   014220          698#  1988  2106  2236  2251  2267  2797
$NWTST= 000001         1299#  1353#  1389#  1424#  1459#  1488#  1528#  1557#  1603#  1627#  1657#  1687#  1717#
                       1747#  1913#  2039#  2121#  2277#  2439#  2600#  2762#
$OCNT   037634         3685*  3721*  3734#
$OMODE  037636         3680*  3684*  3689  3692*  3703*  3736#
$OVER   036416         3435   3454   3465#
$PASS   014344          740#  1210*  3305*  3306*  3318  3407
```

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$PASTM  000236          603#
$PGM1   043752         1887    4268#
$PGM2   044000         1890    4272#
$PGM3   044014         1893    4274#
$POWER  034464         1832    3136#
$PSWR   014660          838#   1103*   1106    3391    3403*
$PWRDN  034656         1846    2929    3168#   3255
$PWRUP  035142         3201    3227#
$QUES   014332          728#
$RDCHR= ****** U       3964
$RDDEC= ****** U       3964
$RDLIN= ****** U       3964
$RDOCT= ****** U       3964
$REGAD  014236          707#
$REG0   014240          709#   1836*   4573    4575    4578    4582    4584    4586
$REG1   014250          711#   1999*   2020*   2875*   2947*   3973*   4573    4575    4580    4582    4584
$REG2   014260          713#   2001*   2021*   2948*   4575    4582    4584
$REG3   014270          715#   2002*   4582
$REG4   014300          717#
$R2A  = ****** U       3964
$SAVRE= ****** U       3964
$SCOPE  036252         3433#
$SETUP= 000034          584#   3292    3434
$STUP = 177777          584#
$SVLAD  036356         3443    3449    3456#
$SVPC = 000200          563#    568
$SWR  = 141000            1#      11     724     728    1304    1358    1394    1429    1464    1493    1533    1562    1608
                       1632    1662    1692    1722    1752    1918    2044    2126    2282    2444    2605    2767    3284
                       3292    3383    3406    3407    3427    3428    3429    3430    3434    3446    3448    3449    3450
                       3456    3462    3465    3468
$SWREG  014360          748#   1081    1087
$SWRMK= 000000         3430
$TESTN  014342          739#   3459*
$TKB    014212          695#   2842
$TKS    014210          694#   2390    2395    2552    2557    2713    2718    2840
$TMP0   014310          719#   1156*   1159
$TMP1   014312          720#
$TMP2   014314          721#
$TMP3   014316          722#
$TMP4   014320          723#
$TN   = 000026            1#      11    1299    1303    1304#   1349    1353    1357    1358#   1387    1389    1393    1394#
                       1420    1424    1428    1429#   1454    1459    1463    1464#   1482    1488    1492    1493#   1524
                       1528    1532    1533#   1553    1557    1561    1562#   1599    1603    1607    1608#   1623    1627
                       1631    1632#   1653    1657    1661    1662#   1683    1687    1691    1692#   1713    1717    1721
                       1722#   1743    1747    1751    1752#   1777    1913    1917    1918#   2039    2043    2044#   2121
                       2125    2126#   2277    2281    2282#   2439    2443    2444#   2600    2604    2605#   2762    2766
                       2767#
$TPB    014216          697#   3917*
$TPFLG  014223          701#
$TPS    014214          696#   3915
$TRAP   040520         1065    3931#
$TRAP2  040554         3945#   3956
$TRP  = 000006         3949#   3958#   3959#   3960#   3961#   3962#
$TRPAD  040566         3936    3956#
$TSTM   000234          602#
$TSTNM  014002          615#   1951*   1957    1979*   2074*   2080    2097*   2157*   2165    2230*   2283*   2336    2445*
```

```
                    2498    2606*   2659    2767*   2781    3427    3456*   3459    3465    3468    3488    3559    4577
                    4578    4580    4582    4584    4586
$TYPBN= ****** U    3962
$TYPDS  037642      3754#   3961
$TYPE   040072      3623    3816#   3825    3949    3957
$TYPOC  037366      3683#   3958
$TYPON  037402      3682    3685#   3960
$TYPOS  037342      3678#   3959
$UNIT   014350       742#
$UNITM  000240       604#
$USWR   014362       749#
$VECT1  014406       774#
$VECT2  014410       775#
$XTSTR  036262      3437#
$$GET4= 000001      3383#   3384#
$$STP   014200       690#   1057    1208    1237    1241    1245    1333    1338    1386    1406    1407    1441    1442
                    1474    1514    1543    1551    1610    1622    1642    1651    1672    1681    1702    1711    1732
                    1741    1766    1775    1829    1921    2046    2128    2298    2349    2460    2511    2621    2672
                    2928    3032    3176    3298    3405
$OFILL  037635      3679*   3683*   3693    3735#
$40CAT= ****** U    3434
.       = 111270     552#    556#    563     564#    566#    568#    574#    576#    589     590#    592#    594#    612#
                     731     847#   1041#   1130    1169    1207    1325    1336    1343    1347    1369    1399    1413
                    1417    1434    1448    1452    1470    1500    1518    1522    1539    1570    1614    1638    1668
                    1698    1728    1762    2016    2429    2591    2752    3119    3122    3263    3267    3317#   3407
                    3408#   3468    3506#   3644#   3810#   4590#   4591#   4592#
.IIST   = 000000     480#   3292
.$ASTA= ****** U    3596    3599
.$X     = 000230     589#    594
```

```
AFORK      18#  1919  2044  2126
BFORK      19#  2771
BLK       615#   624   628   632   636   649   653   657   661   665   674   683   687   725
BLKB      615#   616   620   641   645   669
COMMEN      1#   474#
DEQUE      28#  3870  3892
E           1#
ENDCOM      1#   474#
ENQUE      26#  3843  3849
ERROR      97#  1974  2003  2022  2224  2263  2323  2399  2416  2485  2561  2578  2646  2722  2739
          2876  2935  2949  3974
ESCAPE      1#   474#
EXTRAS     32#   800
GETLID     26#  1837  3409
GETPID     25#  2011
GETPRI      1#   474#
GETSID     24#
GETSWR      1#   474#
IISTD      23#
IISTE      22#  1990
LOOP       15#  1349  1387  1419  1454  1482  1524  1553  1598  1623  1653  1683  1713  1743  1777
LOOPX      15#  1349  1387  1420  1454  1482  1524  1553  1599  1623  1653  1683  1713  1743  1777
MEMBOX     20#  2283  2445  2606
MULT        1#   474#
NEWTST      1#   474#  1299  1353  1389  1424  1459  1488  1528  1557  1603  1627  1657  1687  1717
          1747  1913  2039  2121  2277  2439  2600  2762
P          16#  3531
POP         1#   474#  3638  3639  3795
PUSH        1#   474#  3599  3601  3622  3754
QINIT      28#  1070
REPORT      1#   474#
RESPRI     30#
SAVPRI     29#
SCOPE      98#
SETK       15#  1320  1329  1358  1464  1493  1504  1533  1544  1562  1574  1608  1645  1675  1705
          1735  1752
SETPRI      1#   474#
SETS       15#  1394  1403  1632  1643  1662  1673
SETTRA   3949#  3958  3959  3960  3961
SETU       15#  1429  1438  1692  1703  1722  1733
SETUP       1#   474#
SKIP        1#   474#
SLASH       1#   474#
SPACE     474#
STARS       1#   474#   561   586   588   595   608   731   734  1299  1301  1353  1355  1389  1391
          1424  1426  1459  1461  1488  1490  1528  1530  1557  1559  1603  1605  1627  1629  1657
          1659  1687  1689  1717  1719  1747  1749  1913  1915  2039  2041  2121  2123  2277  2279
          2439  2441  2600  2602  2762  2764  3274  3424  3594  3655  3744  3925
SWRSU       1#   474#
SYNC       20#
TEST       15#  1302  1356  1392  1427  1462  1491  1531  1560  1606  1630  1660  1690  1720  1750
          1916  2042  2124  2280  2442  2603  2765
TRMTRP   3949#
TSTNO      20#  1953  2076  2161  2331  2493  2654  2776
TSTNUM     15#  1303  1357  1393  1428  1463  1492  1532  1561  1607  1631  1661  1691  1721  1751
          1917  2043  2125  2281  2443  2604  2766
```

```
TYPBIN      1#    474#
TYPDEC      1#    474#  1159  1873  1962  2085  2180  2191  3318  3334  3343  3352  3361  3368
TYPNAM      1#    474#
TYPNUM      1#    474#
TYPOCS      1#    474#
TYPOCT      1#    474#  1109
TYPTXT      1#    474#  3314  3321  3328  3337  3346  3355  3364  3569
UBER       32#   1476  1507  1546  1576  1587  1646  1676  1706  1736  1768  3026
UBES       31#   1322  1366  1396  1431  1467  1497  1536  1567  1611  1635  1665  1695  1725  1759
V          17#   3576
VS         18#
$MSTRT      1#
$$CMRE    606#    709   711   713   715   717
$$CMTM    606#    719   720   721   722   723
$$ESCA      1#    474#
$$NEWT      1#    474#  1299  1353  1389  1424  1459  1488  1528  1557  1603  1627  1657  1687  1717
           1747   1913  2039  2121  2277  2439  2600  2762
$$SET     3949#   3958  3959  3960  3961
$$SKIP      1#    474#
.EQUAT      1#
.HEADE      1#
.IIST       1#    477
.KT11       1#
.SETUP      1#    584
.SWRHI      1#
.$ACT1      1#    559
.$APTB      1#    732#
.$APTH      1#    584
.$APTY      1#   3592
.$ASTA      1#
.$CATC      1#    550
.$CMTA      1#    606
.$DB2D      1#
.$DB2O      1#
.$DIV       1#
.$EOP       1#   3272
.$ERRO      1#
.$ERRT      1#
.$MULT      1#
.$POWE      1#
.$RAND      1#
.$RDDE      1#
.$RDOC      1#
.$READ      1#
.$R2AZ      1#
.$SAVE      1#
.$SB2D      1#
.$SB2O      1#
.$SCOP      1#   3422
.$SIZE      1#
.$SUPR      1#
.$TRAP      1#   3923
.$TYPB      1#
.$TYPD      1#   3742
.$TYPE      1#
.$TYPO      1#   3653
```

```
.$40CA      1#
.1170       1#     90


. ABS.  111270     000


 ERRORS DETECTED:  0

 CEKBGC.BIN,CEKBGC.LST/CRF/SOL/NL:TOC=CEKBGC.SML,CEKBGC.P11
 RUN-TIME: 62 58 5 SECONDS
 RUN-TIME RATIO: 196/127=1.5
 CORE USED:  39K  (77 PAGES)
```