.REPT 0

IDENTIFICATION

Product Code:	MAINDEC-11-DQKKA-A-D
PRODUCT NAME:	11/6X CACHE DIAGNOSTIC
DATE:	MARCH,1977
MAINTAINER:	DIAGNOSTIC GROUP
AUTHOR:	WARREN SALTZ

TABLE OF CONTENTS

1.0 ABSTRACT

The 11/6X Cache Diagnostic is comprised of a series of tests which were designed to check the cache's data paths on the Cache/KT board and its control logic on the Bus Control module. The tests are arranged in a logical order such that they build on one another. That is, the currently running test will depend on logic exercised by previous tests. Basic cache operations are exercised first followed by address and data functions. Those tests requiring extensive amounts of cache functioning are done near the end of the program. This testing procedure should provide a very effective degree of fault isolation.

2.0 SYSTEM REQUIREMENTS

2.1 Hardware

1. A working 11/6X CPU
2. A minimum of 13K to a max of 124K of memory. 124K is needed for complete check of TAG memory.
3. A console terminal (not mandatory under APT)
4. One of the following peripherals if NPR DATOs are to be tested (SW8=1).

    a. Unibus Exercisor (M7885)
    b. Bus Tester (old)
    c. RK05
    d. RP03
    e. TU10

5. When running under APT and either the NPR DATO tests (SW08=1) or the power up tests (SW07=1) are to be run, the diagnostic assumes a default peripheral of the Unibus Exercisor (M7885). In addition it assumes its data buffer address (BEDB) is 770000.

2.2 Software

This diagnostic will run under ACT/APT, XXDP and stand alone. When running under one of the various system testers, there should be no peripheral device doing any NPR DATO traffic on the bus (except those specifically chosen and under control of the diagnostic).

2.3 APT Setup

When running under APT and the NPR device tests or the power down tests are to be run, the APT software switch reg (switch 8 & 7 respectively) should be set (see sec. 6.0). The default APT device must be present when this is done (see

2.1.5).

2.4 Execution Time

For an error free, first run pass on a PDQ with core memory, it takes approximately 15 seconds.

3.0 DIAGNOSTIC HIERARCHY PREREQUISITES

It is assumed that CPU, memory, KT and stack limit are working properly for this program to give correct error reports. If not, their respective diagnostic should be run before the cache diagnostic. In addition, if one of the peripheral devices (see 2.1-4) is chosen, it is assumed to be error free. If not, further tests using the device are skipped.

4.0 STARTING ADDRESS

200 for normal startup

5.0 PROGRAM CONTROL AND OPERATOR ACTION

5.1 The standard diagnostic loading procedures are to be followed.

5.2 Load address 200

5.3 If the power up test is to be run set switch 07=1. If not running under APT after the test is started and the message "POWER MACHINE DOWN AND THEN UP" is typed, the machine should be powered down and up. The test will then continue. If running under APT & SW07=1, the program assumes the Unibus Exerciser is available. There is no type out when the exerciser is used in this manner.

5.4 If one of the peripheral devices is available (see 2.1-4) and the NPR DATO tests are to be done, set switch 8=1. Upon start of the program, the following beginning message will be typed (under APT message is not typed see sec. 6.8):

"TYPE WHICH DEVICE SHOULD BE USED:"

0 - [carriage return] - Unibus Exercisor (M7885)
1 - [carriage return] - Bus Tester Old
2 - [carriage return] - RK05
3 - [carriage return] - RP03
4 - [carriage return] - TU10

Before any device is chosen, it should be powered up and in the Ready state. The device should be write enabled and a scratch disk or tape should be mounted if the corresponding peripheral is used. The operator should then choose one of the devices and indicate his choice with a carriage return. If an incorrect entry is made (<0 or >4) the message "?INVALID ENTRY, TRY AGAIN" is typed. The program then waits for a correct value to be chosen. A rubout feature is provided to delete a typing error.

Depending upon the operator's choice, different information will have to be supplied by the user. The dialogue for each device is as follows:

a. 0 - Unibus Exercisor new

The following message is printed:

"TYPE THE UBE'S DATA BUFFER ADDRESS"

The operator should then supply the requested information. If the data is valid, the program proceeds to the first test. If there is no response to the address, the following message is printed:

"DEVICE DOES NOT RESPOND;
REFERENCE TO IT TRAPS TO 4."

"?INVALID ENTRY, TRY AGAIN."

If the entry typed is not a valid data buffer address, the following message is printed:

"?INVALID ENTRY, TRY AGAIN"

In either case, the user should retype the correct data buffer address or restart the test and choose another device.

b. 1 - Unibus Exercisor old

No further operator action is needed if the device is present. If a reference to it times out, the following message is typed:

"DEVICE DOES NOT RESPOND
REFERENCE TO IT TRAPS TO 4"

The program then retypes the beginning message and the user must choose another device.

c. 2 - RK05

If the RK05 is present, the following message is printed:

"WHICH DRIVE SHOULD BE USED?
TYPE Ø-7 <CARRIAGE RETURN>"

The user should then type the device number he wishes to use and indicate his choice with a carriage return. If a valid drive is chosen (>Ø,=Ø or <8) the program proceeds to the first test. If it is invalid, the following message is typed:

"?INVALID ENTRY, TRY AGAIN"

The operator should then choose a correct drive number or restart the test and choose another device.

If a reference to an RKØ5 register times out, the RKØ5 is assumed not present or inoperable. In this case the following message is typed:

"DEVICE DOES NOT RESPOND
REFERENCE TO IT TRAPS TO 4"

The program then retypes the beginning message and the user must choose another device.

d. 3 - RPØ3

If the RPØ3 is present the following message is printed:

"WHICH DRIVE SHOULD BE USED?
TYPE Ø-7 <CARRIAGE RETURN>"

The user should then type the drive number he wishes to use and indicate his choice with a carriage return. If a valid drive is chosen (>Ø,=Ø or <8), the program proceeds to the first test. If it is invalid, the following message is typed:

"?INVALID ENTRY, TRY AGAIN"

The operator should then choose a correct drive number or restart the test and choose another device.

If a reference to an RPØ3 register times out, the RPØ3 is assumed not present or inoperable. In this case the following message is typed:

"DEVICE DOES NOT RESPOND
REFERENCE TO IT TRAPS TO 4"

The program then retypes the beginning message and the user must choose another device.

e. 4 - TUIØ

If the TUIØ is present, the following message is printed:

"WHICH DRIVE SHOULD BE USED?
TYPE 0-7 <CARRIAGE RETURN>"

A scratch tape should be mounted and the user should then type the drive number he wishes to use and indicate his choice with a carriage return. If a valid drive number is chosen, the device is selected properly, and the write protect is off, the program proceeds to the first test. If any of the above are false the proper message is typed. The operator should then correct the problem and then choose another drive number.

If in the initial set up of the tape drive the ready bit fails to set or the error bit sets, one of the following messages is then typed:

"DEVICE READY BIT DOES NOT SET"

or

"DEVICE ERROR BIT SET"

In either case the TU10 is assumed defective and the beginning message is then typed. The user must then choose another device.

5.5 Start the Program

6.0 SWITCH OPTIONS

```
SW<15>=1=100000  Halt on Error
SW<14>=1=040000  Loop on Test
SW<13>=1=020000  Inhibit Error Typeouts
SW<12>=1=010000  Inhibit Tests Using Memory Management
SW<11>=1=004000  Inhibit Iterations
SW<10>=1=002000  Bell on Error
SW<09>=1=001000  Loop on Error
SW<08>=1=000400  Enable NPR Device Tests
SW<07>=1=000200  Enable Power up Test
```

6.1 SW<15>

When set, the program halts on encountering an error after printing out the error message. Pressing continue restores normal program operation.

6.2 SW<14>

The program loops on the subtest that is being executed when the switch is set.

6.3 SW<13>

When set, this switch inhibits all error typeouts.

6.4 SW<12>

When set, this switch inhibits those tests using memory management. This switch should only be used when there is reason to believe that the KT is failing. Significant portions of cache will not be tested when this switch is set.

6.5 SW<11>

When set, iterations of each test is inhibited.

6.6 SW<10>

When set, the bell is rung upon encountering an error.

6.7 SW<09>

When set, upon finding an error, the program will cycle from the point of error to the previous scope statement or error loop ($LPERR). (see sec. 9.2).

6.8 SW<08>

When set, the NPR device tests will be run. It also enables the user interactive questions at the start of the test (see sec. 5.4). These questions are only asked on the first pass of the program. This switch should only be set before the program is started. When running under APT a default NPR device (Unibus Exercisor) is assumed and no questions are asked.

6.9 SW<07>

When set, the power up test is run (see sec. 5.3). This switch should not be set when running under ACT since user intervention is required. When running under APT a default device (Unibus Exercisor) is assumed.

7.0 PROGRAM DESCRIPTION

Upon start of the program, the cache is immediately turned off (force miss is on for both halfs of cache). The tests then proceed to selectively turn on only the half of cache that is to be exercised. The half of cache that is on is the half where the test locations reside. The half that is off always corresponds to the address space of the test instructions. This is to ensure that the instructions are not executed out of a possibly bad cache. In order to implement this scheme, the program was made non-contiguous between certain subtests.

The tests are structured on a half cache basis. That is several tests may be run on the low cache and then when the instruction address space has changed sufficiently to overlap the low cache addresses, the same tests will be repeated for the high cache addresses (low cache is defined as that portion of cache with physical address A10=0, high cache is defined as that portion of cache with physical address A10=1). This is done until cache is sufficiently checked out to assure that when all of it is turned on, there is a high probability that instructions can be executed out of it.

To facilitate the testing of cache, a 1K buffer is reserved at the end of the program for read and write operations. The starting address is BUFL corresponding to the first low cache address (A1-A9=0). The address BUFH corresponds to the first high cache address.

Immediately after the program is started the program identifies itself and then if SW8=1 it will interrogate the user about which peripheral device to use for the entire test (see sec. 5.4). This is only done on program start and not repeated for subsequent program loops. The interrogation is not done if running under APT. After this tests 1-47 are run.

8.0 ERROR REPORTING AND FAULT ISOLATION

Error calls are made via the EMT instruction. The lower byte of the instruction is encoded to indicate the error number. For example ERROR 1 would be (EMT+1) or 104001. Once an error instruction is executed, an error handler routine will then process the error call. The error message to be typed is determined from the item table at the end of the program. Item 1 corresponds to error 1 and so on. The item table contains a series of pointers to the message to be typed.

All error messages are identified by the words "ERROR: " or "FATAL ERROR: ".

A fatal error is a catastrophic failure which would cause all further printouts to be wrong or misleading. This is because fatal errors are only used to report failures in the hit reg and the cache control register. The entire diagnostic depends on this hardware functioning. A fatal error aborts the program and end of pass count is typed. In an "error" typeout only the individual test will be skipped. In some instances, the test will be continued until a max number of errors (usually 3) have been encountered. This is only done in cases where additional error information would aid in isolation.

The contents of the error reports identifies the hardware under test at the time of failure. Other pertinent information such as contents of cache control fields and

failing addresses are also reported. The address information is reported as physical address high (P ADDH) corresponding to address bits A17, A16 and physical address low (P ADDL) corresponding to A15-A0.

When trouble shooting a failing board, the first error reported should be the first one fixed. This is because the nature of the software and hardware can create additional, false or misleading error messages to appear after the first one. Since the tests build on one another and involve previously tested hardware, it will aid in the fault isolation to look up the tests previously run to know which hardware has been tested. It should be pointed out that the probability of the error lying on the bus control board will decrease after the basic cache tests are successfully completed. The bus control contains a great deal of cache's hardcore control logic which if not functioning will mean, many times, that the cache diagnostic or any program can not run out of cache. Because of this, if the diagnostic reports an error, there is a higher probability of it lying on the Cache/MT board than the Bus Control board.

9.0 HANDLERS AND COMMON ROUTINES

9.1 End of Pass Routine

This routine takes care of transferring control to the monitor (if one exists) or to the beginning of the program. It indicates the pass number each time it is executed.

9.2 Scope Handler

This handler is called via the 'IOT' trap. When 'scope' is executed an 'IOT' trap occurs to the memory location '$SCOPE'. Depending on the switch settings, the handler then decides to loop on test, loop on error etc. The scope statement that is located at the first instruction of the following test is the one that enabled the desired action (looping etc.) for the present test.

9.3 Error Handler

This handler uses the 'EMT' trap. The lower byte of the instruction is encoded to indicate the error number. For example ERROR 1 would be (EMT+1) or 104001. Once an error instruction is executed the error handler determines the message to be typed. An item table at the end of the program contains pointers for each message to be typed. Each item corresponds to each error (Item 1 corresponds to error 1). The 'ERRTYP' routine then processes the table for the final error type out.

9.4 Memory Size Routine

This routine sizes memory to find the maximum memory size. If bit7 of location $KT11=1, before the routine is called, memory management will be used. $LSTAD contains the last virtual address of the last bank if memory management is used. Otherwise it contains the last absolute address of available memory. $LSTBK will contain the last bank as a page address register.

9.5 Trap Handler

This handler uses the trap instruction. The lower byte of the instruction is encoded differently for each of the different routines that use it. When a call for a routine is executed a trap occurs to the handler located at $TRAP. The handler then determines by looking at the lower byte which address to go to for servicing the call. The following routines use this handler:

1. TYPE - this routine is used to type ASCIZ messages.
2. TYPOCT, TYPOS & TYPON - These routines are used to change a binary number to a 6 digit octal number and type it.
3. RDOCT - this routine will read an octal number from the TTY.
4. RDLIN - this routine will input an ASCII string from the TTY.
5. TYPDS - this routine converts a binary number to decimal and types it.

9.6 Power Down and Up Routines

When a power fail condition occurs, the contents of registers R0-R7 are saved on the stack. When the power returns, the same registers are restored.

9.7 Trap Catcher

This is a series of instructions starting in location 0 to detect unexpected traps and interrupts to the trap and interrupt vector area of memory.

Each vector PC address is loaded with the address of the next location. The next location is loaded with a halt. Thus an illegal trap or interrupt will cause a halt at the trap PSW location plus 2.

Once a halt occurs, by examining the contents of the address pointed to by the stack, the value of the PC when the trap or interrupt occurred can be determined.

9.8 UPERR

This subroutine is used to report unexpected parity errors while the program is running. At the beginning of each test a pointer to the next test is saved. Any spurious parity error is reported and then the test following the one with the error is started.

9.9 UT4

This subroutine reports unexpected traps to 4. After the error is reported, the machine will be halted. Pressing continue will restart the program.

9.10 VIP

This subroutine takes a virtual address stored in location $TMP0 and converts it to a physical address. The physical address bits A17, A16 are stored in $REG1 and bits A0 - A15 are stored in $REG2.

9.11 TAG

This subroutine calculates the tag field from a page address register's contents stored in $TMP0.

9.12 VEC

This subroutine finds out if a new Unibus Exercisor module is being used and if so puts an RTI in its interrupt vector.

9.13 HUBEN

This subroutine sets up the new Unibus exercisor to do one NPR DATO to the address following the subroutine call.

9.14 HUBEO

This subroutine sets up the old Unibus Exercisor to do one NPR DATO to the address following the subroutine call.

9.15 HRK05

This subroutine sets up the RK05 to do NPR DATO's to the starting address following the subroutine call.

9.16 HRP03

This subroutine sets up the RP03 to do NPR DATO's to the starting address following the subroutine call.

9.17 HTU10

This subroutine sets up the TU10 to do NPR DATO's to the starting address following the subroutine call.

9.18 HAD

This subroutine generates an address in a 1K test buffer at the end of the program. The address is (512)10 locations from the given address following this subroutine call.

9.19 SWEEP

This routine rids cache of bad parity. It is called after all cache has been turned off.

.ENDR

```
                                .TITLE  MD-11-DQKKA-A 11/6X CACHE  DIAGNOSTIC
                                ;*COPYRIGHT (C) APRIL 11,1975
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*PROGRAM BY WARREN L. SALTZ
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*
000001                          $TN=1
                                .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        12            INHIBIT TEST USING MEMORY MANAGEMENT
                                ;*        11            INHIBIT ITERATIONS
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
                                ;*         8            ENABLE NPR DEVICE TESTS
                                ;*         7            ENABLE POWER UP TEST

                                ;;*****************************************************************
                                ;;*****************************************************************
                                .SBTTL  BASIC DEFINITIONS

                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                          STACK=  1100
                                .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
                                .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL

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

                                ;*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
```



```
000006                          SP=     %6              ;;STACK POINTER
000007                          PC=     %7              ;;PROGRAM COUNTER

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

                                ;*"SWITCH REGISTER" SWITCH DEFINITIONS
100000                          SW15=   100000
040000                          SW14=   40000

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

                                ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                          BIT15=  100000
040000                          BIT14=  40000
020000                          BIT13=  20000
010000                          BIT12=  10000
004000                          BIT11=  4000
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
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```
                        BIT01=  2
                        BIT00=  1
                        .EQUIV  BIT09,BIT9
                        .EQUIV  BIT08,BIT8
                        .EQUIV  BIT07,BIT7
                        .EQUIV  BIT06,BIT6
                        .EQUIV  BIT05,BIT5
                        .EQUIV  BIT04,BIT4
                        .EQUIV  BIT03,BIT3
                        .EQUIV  BIT02,BIT2
                        .EQUIV  BIT01,BIT1
                        .EQUIV  BIT00,BIT0

                        ;*BASIC "CPU" TRAP VECTOR ADDRESSES
000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
000014                  TBITVEC=14              ;;"T" BIT
000014                  TRTVEC= 14              ;;TRACE TRAP
000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
000024                  PWRVEC= 24              ;;POWER FAIL
000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
000034                  TRAPVEC=34              ;;"TRAP" TRAP
000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
                        .SBTTL  MEMORY MANAGEMENT DEFINITIONS

                        ;*KT11 VECTOR ADDRESS

000250                  MMVEC=  250

                        ;*KT11 STATUS REGISTER ADDRESSES

177572                  SR0=    177572
177574                  SR1=    177574
177576                  SR2=    177576
172516                  SR3=    172516

                        ;*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
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```
                        SIPAR5= 172252
                        SIPAR6= 172254
                        SIPAR7= 172256

                        ;*SUPERVISOR "D" PAGE ADDRESS REGISTERS

                        SDPAR0= 172260
                        SDPAR1= 172262
                        SDPAR2= 172264
                        SDPAR3= 172266
                        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

                                ;*OTHER EQUATES
177752                  HMR=177752              ;HIT/MISS REG ADDRESS
177746                  CCR=177746              ;CACHE CONTROL REG ADDRESS
000106                  CDH=106                         ;CACHE DATA HIGH ADDRESS
000106                  CDL=106                         ;CACHE DATA LOW ADDRESS
000107                  CTAG=107                        ;CACHE TAG ADDRESS
177744                  EREG=177744                     ;MEMORY ERROR REG ADDRESS
177766                  CER=177766              ;CPU ERROR REG ADDRESS
000101                  HIADD=101               ;HIGH UNIBUS ADDRESS OF ERROR
000102                  LOADD=102               ;LOW UNIBUS ADDRESS OF ERROR
055016                  BSD=55016                       ;BACKING STORE DATA ADDRESS
060000                  BUFL=60000              ;LOW ADDRESS BUFFER (A10=0)
062000                  BUFH=BUFL+2000          ;HIGH ADDRESS BUFFER (A10=1)
076600                  MED=    76600          ;MAINTENANCE INSTRUCTION
000100                  RJAM=   100             ;LOG READ ADDRESS FOR JAM REG.
000101                  RSER=   101             ;LOG READ ADDRESS FOR SERVICE REG.
000102                  RPBA=   102             ;LOG READ ADDRESS FOR PHYSICAL BUS ADDR.
000107                  RTAG=   107             ;LOG READ ADDRESS FOR CACHE TAG
000106                  RDAT=   106             ;LOG READ ADDRESS FOR CACHE DATA
000022                  RLOG=   22              ;READ ADDRESS FOR CPU INTERNAL REG "WHAMI"
000222                  WLOG=   222             ; WRITE ADDRESS FOR CPU INTERNAL REG "WHAMI"
000304                  WFLI=   304             ;WRITE ADDRESS FOR CPU INTERNAL REG "FLAG/INT"
000226                  WSW=    226             ;WRITE ADDRESS FOR CPU INTERNAL REG "SWITCH REG"
000352                  WINIT=  352             ;WRITE ADDRESS FOR CPU INTERNAL REG "INIT REG"(MOD FOR D
177572                  MMR0=SR0                ;KT11 STATUS REG
177576                  MMR2=SR2                ;KT11 STATUS REG
000114                  PVEC=114                ;PARITY TRAP VECTOR
177400                  RKDS=   177400          ;RK05 DRIVE STATUS REG
177402                  RKER=   177402          ;RK05 ERROR REG
177404                  RKCS=   177404          ;RK05 CONTROL STATUS REG
177406                  RKWC=   177406          ;RK05 WORD COUNT REG
177410                  RKBA=   177410          ;RK05 CURRENT BUS ADDRESS REG
177412                  RKDA=   177412          ;RK05 DISK ADDRESS REG
176710                  RPDS=   176710          ;RP03 DEVICE STATUS REG
176712                  RPER=   176712          ;RP03 ERROR REG
176714                  RPCS=   176714          ;RP03 CONTROL STATUS REG
176716                  RPWC=   176716          ;RP03 WORD COUNT REG
176720                  RPBA=   176720          ;RP03 BUS ADDRESS REG
176722                  RPCA=   176722          ;RP03 CYLINDER ADDRESS REG
176724                  RPDA=   176724          ;RP03 DISK ADDRESS REG
172520                  MTS=    172520          ;TU10 STATUS REG
172522                  MTC=    172522          ;TU10 COMMAND REG
172524                  MTBRC=  172524          ;TU10 BYTE RECORD COUNTER
172526                  MTCMA=  172526          ;TU10 CURRENT MEMORY ADDRESS REG
000001                  HMR0=   1               ;HIT MISS REG BIT 0
000002                  HMR1=   2               ;HIT MISS REG BIT 1
000004                  HMR2=   4               ;HIT MISS REG BIT 2
000010                  HMR3=   10              ;HIT MISS REG BIT 3
000020                  HMR4=   20              ;HIT MISS REG BIT 4
000040                  HMR5=   40              ;HIT MISS REG BIT 5
000015                  CR=     15              ;CARRIAGE RETURN
000012                  LF=     12              ;LINE FEED
```

```
                                ;;*****************************************************************
                                .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
                                ;;*****************************************************************
                        000200          LOC=.
                        000200          .=200

                                .SBTTL  STARTING ADDRESS(S)


000200  012737  000214  177746          MOV     #214,@#CCR      ;TURN CACHE OFF
000206  000137  001362                  JMP     @#START         ;JUMP TO STARTING ADDRESS OF PROGRAM.
                        000200          .=LOC
                        001000          .=1000
                                .SBTTL  APT PARAMETER BLOCK

                                ;;*****************************************************************
                                ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                ;;*****************************************************************
                        001000          .$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  001000                          $APTHDR ;;POINT TO APT HEADER BLOCK
                        001000          .=.$X   ;;RESET LOCATION COUNTER
                                ;;*****************************************************************
                                ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                ;INTERFACE SPEC.

                        001000  $APTHD:
001000  000000        $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001002  001236        $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001004  000060        $TSTM:  .WORD   60      ;;RUN TIM OF LONGEST TEST
001006  000060        $PASTM: .WORD   60      ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001010  000000        $UNITM: .WORD           ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001012  000052                  .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
                                .SBTTL  ACT11 HOOKS

                                ;;*****************************************************************
                                ;HOOKS REQUIRED BY ACT11
                        001014          $SVPC=.                 ;SAVE PC
                        000046          .=46
000046  033106                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                        000052          .=52
000052  000000                  .WORD   0               ;;2)SET LOC.52 TO ZERO
                        001014          .=$SVPC                 ;; RESTORE PC


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



```
                                .SBTTL  COMMON TAGS

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

                        001100          .=1100
001100                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000                  .WORD   0
001102      000         $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103      000         $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114      000         $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115      001         $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134  177570          SWR:    .WORD   DSWR            ;;OF SWITCH REGISTER
001136  177570          DISPLAY:.WORD   DDISP           ;;OF DISPLAY REGISTER
001140  177560          $TKS:   177560                  ;;TTY KBD STATUS
001142  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001144  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG.
001146  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG.
001150      000         $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001151      002         $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001152      012         $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001153      000         $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001154  000000          $REGAD: .WORD   0               ;;CONTAINS THE FROM
                                                        ;;WHICH ($REG0) WAS OBTAINED
001156  000000          $REG0:  .WORD   0               ;;CONTAINS (($REGAD)+0)
001160  000000          $REG1:  .WORD   0               ;;CONTAINS(($REGAD)+2)
001162  000000          $REG2:  .WORD   0               ;;CONTAINS(($REGAD)+4)
001164  000000          $REG3:  .WORD   0               ;;CONTAINS(($REGAD)+6)
001166  000000          $REG4:  .WORD   0               ;;CONTAINS(($REGAD)+10)
001170  000000          $REG5:  .WORD   0               ;;CONTAINS(($REGAD+12)
001172  000000          $TMP0:  .WORD   0               ;;USER DEFINED
001174  000000          $TMP1:  .WORD                   ;;USER DEFINED
001176  000000          $TMP2:  .WORD   0               ;;USER DEFINED
001200  000000          $TMP3:  .WORD   0               ;;USER DEFINED
001202  000000          $TMP4:  .WORD   0               ;;USER DEFINED
001204  000000          $TMP5:  .WORD   0               ;;USER DEFINED
001206      077         $QUES:  .ASCII  /?/             ;;QUESTION MARK
001207      015         $CRLF:  .ASCII  <15>            ;;CARRIAGE RETURN
001210  000012          $LF:    .ASCIZ  <12>            ;;LINE FEED
001212  000000          CREG1:  .WORD   0               ;CONTROL REG ADDR. FOR NPR DEVICE
001214  000000          CREG2:  .WORD   0               ;CONTROL REG ADDR. FOR NPR DEVICE
001216  000000          CREG3:  .WORD   0               ;CONTROL REG ADDR. FOR NPR DEVICE
001220  000000          CREG4:  .WORD   0               ;CONTROL REG ADDR. FOR NPR DEVICE
001222  000000          CREG5:  .WORD   0               ;CONTROL REG ADDR. FOR NPR DEVICE
```

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449  001224  000000                  CREG6:  .WORD   0               ;CONTROL REG ADDR. FOR NPR DEVICE
450  001226  000000                  IVEC:   .WORD   0               ;ADDRESS OF DEVICE'S INTERRUPT VECTOR
451  001230  000000                  EAD:    .WORD   0               ;ADDRESS OF DEVICE'S ERROR REG
452  001232  000000                  SETUP:  .WORD   0               ;ADDRESS OF DEVICE'S HANDLER
453  001234  000000                  SKTST:  .WORD   0               ;;POINTER TO TEST FOLLOWING ONE BEING EXECUTED
454
455                                  .SBTTL  APT MAILBOX-ETABLE
456
457                                  ;;*************************************************************
458                                  .EVEN
459  001236                          $MAIL:                          ;;APT MAILBOX
460  001236  000000                  $MSGTY: .WORD   AMSGTY   ;;MESSAGE TYPE CODE
461  001240  000000                  $FATAL: .WORD   AFATAL   ;;FATAL ERROR NUMBER
462  001242  000000                  $TESTN: .WORD   ATESTN   ;;TEST NUMBER
463  001244  000000                  $PASS:  .WORD   APASS    ;;PASS COUNT
464  001246  000000                  $DEVCT: .WORD   ADEVCT   ;;DEVICE COUNT
465  001250  000000                  $UNIT:  .WORD   AUNIT    ;;I/O UNIT NUMBER
466  001252  000000                  $MSGAD: .WORD   AMSGAD   ;;MESSAGE ADDRESS
467  001254  000000                  $MSGLG: .WORD   AMSGLG   ;;MESSAGE LENGTH
468  001256                          $ETABLE:                        ;;APT ENVIRONMENT TABLE
469  001256     000                  $ENV:   .BYTE   AENV     ;;ENVIRONMENT BYTE
470  001257     000                  $ENVM:  .BYTE   AENVM    ;;ENVIRONMENT MODE BITS
471  001260  000000                  $SWREG: .WORD   ASWREG   ;;APT SWITCH REGISTER
472  001262  000000                  $USWR:  .WORD   AUSWR    ;;USER SWITCHES
473  001264  000000                  $CPUOP: .WORD   ACPUOP   ;;CPU TYPE,OPTIONS
474                                  ;*                              BITS 15-11=CPU TYPE
475                                  ;*                                      11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
476                                  ;*                                      11/70=06,PDQ=07,Q=10
477                                  ;*                              BIT 10=REAL TIME CLOCK
478                                  ;*                              BIT  9=FLOATING POINT PROCESSOR
479                                  ;*                              BIT  8=MEMORY MANAGEMENT
480  001266     000                  $MAMS1: .BYTE   AMAMS1   ;;HIGH ADDRESS,M.S. BYTE
481  001267     000                  $MTYP1: .BYTE   AMTYP1   ;;MEM. TYPE,BLK#1
482                                  ;*                              MEM.TYPE BYTE   --  (HIGH BYTE)
483                                  ;*                                      900 NSEC CORE=001
484                                  ;*                                      300 NSEC BIPOLAR=002
485                                  ;*                                      500 NSEC MOS=003
486  001270  000000                  $MADR1: .WORD   AMADR1   ;;HIGH ADDRESS,BLK#1
487                                  ;*                                MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
488  001272     000                  $MAMS2: .BYTE   AMAMS2   ;;HIGH ADDRESS,M.S. BYTE
489  001273     000                  $MTYP2: .BYTE   AMTYP2   ;;MEM.TYPE,BLK#2
490  001274  000000                  $MADR2: .WORD   AMADR2   ;;MEM.LAST ADDRESS,BLK#2
491  001276     000                  $MAMS3: .BYTE   AMAMS3   ;;HIGH ADDRESS,M.S.BYTE
492  001277     000                  $MTYP3: .BYTE   AMTYP3   ;;MEM.TYPE,BLK#3
493  001300  000000                  $MADR3: .WORD   AMADR3   ;;MEM.LAST ADDRESS,BLK#3
494  001302     000                  $MAMS4: .BYTE   AMAMS4   ;;HIGH ADDRESS,M.S.BYTE
495  001303     000                  $MTYP4: .BYTE   AMTYP4   ;;MEM.TYPE,BLK#4
496  001304  000000                  $MADR4: .WORD   AMADR4   ;;MEM.LAST ADDRESS,BLK#4
497  001306  000000                  $VECT1: .WORD   AVECT1   ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
498  001310  000000                  $VECT2: .WORD   AVECT2   ;;INTERRUPT VECTOR#2BUS PRIORITY#2
499  001312  000000                  $BASE:  .WORD   ABASE    ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
500  001314  000000                  $DEVM:  .WORD   ADEVM    ;;DEVICE MAP
501  001316  000000                  $CDW1:  .WORD   ACDW1    ;;CONTROLLER DESCRIPTION WORD#1
502  001320  000000                  $CDW2:  .WORD   ACDW2    ;;CONTROLLER DESCRIPTION WORD#2
503  001322  000000                  $DDW0:  .WORD   ADDW0    ;;DEVICE DESCRIPTOR WORD#0
504  001324  000000                  $DDW1:  .WORD   ADDW1    ;;DEVICE DESCRIPTOR WORD#1
```



```
505  001326  000000                  $DDW2:  .WORD   ADDW2    ;;DEVICE DESCRIPTOR WORD#2
506  001330  000000                  $DDW3:  .WORD   ADDW3    ;;DEVICE DESCRIPTOR WORD#3
507  001332  000000                  $DDW4:  .WORD   ADDW4    ;;DEVICE DESCRIPTOR WORD#4
508  001334  000000                  $DDW5:  .WORD   ADDW5    ;;DEVICE DESCRIPTOR WORD#5
509  001336  000000                  $DDW6:  .WORD   ADDW6    ;;DEVICE DESCRIPTOR WORD#6
510  001340  000000                  $DDW7:  .WORD   ADDW7    ;;DEVICE DESCRIPTOR WORD#7
511  001342  000000                  $DDW8:  .WORD   ADDW8    ;;DEVICE DESCRIPTOR WORD#8
512  001344  000000                  $DDW9:  .WORD   ADDW9    ;;DEVICE DESCRIPTOR WORD#9
513  001346  000000                  $DDW10: .WORD   ADDW10   ;;DEVICE DESCRIPTOR WORD#10
514  001350  000000                  $DDW11: .WORD   ADDW11   ;;DEVICE DESCRIPTOR WORD#11
515  001352  000000                  $DDW12: .WORD   ADDW12   ;;DEVICE DESCRIPTOR WORD#12
516  001354  000000                  $DDW13: .WORD   ADDW13   ;;DEVICE DESCRIPTOR WORD#13
517  001356  000000                  $DDW14: .WORD   ADDW14   ;;DEVICE DESCRIPTOR WORD#14
518  001360  000000                  $DDW15: .WORD   ADDW15   ;;DEVICE DESCRIPTOR WORD#15
519
520
521  001362                          $ETEND:
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```
                                        ;;*****************************************************************
                                        ;;*****************************************************************

001362                                  START:
                                        .SBTTL  INITIALIZE THE COMMON TAGS
                                        ;;CLEAR THE COMMON TAGS (@CMTAG) AREA
001362  012706  001100                          MOV     #@CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
001366  005026                                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
001370  022706  001134                          CMP     #SWR,R6 ;;DONE?
001374  001374                                  BNE     .-6             ;;LOOP BACK IF NO
001376  012706  001100                          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                        ;;INITIALIZE A FEW VECTORS
001402  012737  035152  000020                  MOV     #@SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
001410  012737  000340  000022                  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
001416  012737  035412  000030                  MOV     #@ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
001424  012737  000340  000032                  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
001432  012737  040306  000034                  MOV     #@TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
001440  012737  000340  000036                  MOV     #340,@#TRAPVEC+2;LEVEL 7
001446  012737  040364  000024                  MOV     #@PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
001454  012737  000340  000026                  MOV     #340,@#PWRVEC+2 ;;LEVEL 7
001462  013737  033054  033046                  MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
001470  005037  035406                          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
001474  005037  035606                          CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
001500  112737  000001  001115                  MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
001506  012737  001506  001106                  MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
001514  012737  001514  001110                  MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                        ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                        ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
001522  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
001526  012737  001562  000004                  MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
001534  012737  177570  001134                  MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
001542  012737  177570  001136                  MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
001550  022777  177777  177356                  CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
001556  001012                                  BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                        ;;AND  THE HARDWARE SWR IS NOT = -1
001560  000403                                  BR      65$             ;;BRANCH IF NO TIMEOUT
001562  012716  001570          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
001566  000002                                  RTI
001570  012737  000176  001134  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
001576  012737  000174  001136                  MOV     #DISPREG,DISPLAY
001604  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

001610  005037  001244                          CLR     $PASS           ;;CLEAR PASS COUNT
001614  132737  000200  001257                  BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
001622  001403                                  BEQ     67$             ;;YES,USE NON-APT SWITCH
001624  012737  001260  001134                  MOV     #@SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
001632                                  67$:
001632  104401  040542                          TYPE    ,MSG1           ;TYPE 11/6X DIAGNOSTIC
```



```
                                        ;////////////////////////////////////////////////////////////////
                                                ;THE FOLLOWING ROUTINE IS USED TO INTERROGATE THE PERSON
                                                ;USING THE PROGRAM WHICH NPR DEVICE HE WISHES TO USE
                                        ;////////////////////////////////////////////////////////////////

001636  012700  170000                          MOV     #170000,R0      ;SAVE UBE ADDRESS IF RUNNING UNDER APT
001642  105737  001256                          TSTB    @#$ENV          ;RUNNING UNDER APT?
001646  001410                                  BEQ     2$              ;BRANCH IF NO
001650  032777  000400  177256                  BIT     #SW08,@SWR      ;ENABLE TESTS USING NPR DEVICES?
001656  001074                                  BNE     UBEAPT          ;BRANCH IF YES TO DEFAULT APT DEVICE:UBE
001660  032777  000200  177246                  BIT     #SW07,@SWR      ;POWER DOWN TESTS TO BE RUN?
001666  001070                                  BNE     UBEAPT          ;BRANCH IF YES TO DEFAULT APT DEVICE:UBE

001670  032777  000400  177236  2$:     BIT     #SW08,@SWR      ;ENABLE TESTS USING NPR DEVICE?
001676  001002                                  BNE     Q2              ;BRANCH IF YES

001700  000137  003056                          JMP     @START1         ;GO TO BEGINNING OF TESTS

001704  104401  040670          Q2:     TYPE    ,MSG3           ;WHICH DEVICE SHOULD BE USED?
001710  104410                  B2:     RDOCT                   ;WAIT FOR REPLY
001712  012600                          MOV     (SP)+,R0        ;GET ANS OFF STACK
001714  020027  000005                  CMP     R0,#5           ;WAS ANS VALID (<5)?
001720  002002                          BGE     Q1              ;BRANCH IF NO
001722  005700                          TST     R0              ;ANS VALID?
001724  002003                          BGE     B1              ;BRANCH IF YES
001726  104401  041202          Q1:     TYPE    ,MSG4           ;?INVALID ENTRY TRY AGAIN
001732  000766                          BR      B2              ;GO WAIT FOR NEW ANS

001734  000005                  B1:     RESET                   ;INITIALIZE ALL DEVICES
001736  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
001744  006300                          ASL     R0              ;ADJUST FOR WORD INDEXING
001746  000170  001752                  JMP     @TAB(R0)        ;GO ASK FURTHER QUESTIONS ON DEVICE

001752  001764                  TAB:    QUBEN                   ;POINTER TO UNIBUS EXERCISOR (NEW) QUESTIONS
001754  002156                          QUBEO                   ;POINTER TO UNIBUS EXERCISOR (OLD) QUESTIONS
001756  002232                          QRK05                   ;POINTER TO RK05 QUESTIONS
001760  002412                          QRP03                   ;POINTER TO RP03 QUESTIONS
001762  002540                          QTU10                   ;POINTER TO TU10 QUESTIONS

                                        ;////////////////////////////////////////////////////////////////
                                                ;UBE NEW QUESTION AND INITIALIZE ROUTINE
                                        ;////////////////////////////////////////////////////////////////

001764  104401  041242          QUBEN:  TYPE    ,MSG5           ;TYPE THE UBE'S DATA BUFFER ADDRESS
001770  104410                  3$:     RDOCT                   ;WAIT FOR ANS
001772  012737  002006  000004          MOV     #1$,@#4         ;SET UP FOR TIME OUTS
002000  012600                          MOV     (SP)+,R0        ;SEE IF DEVOCE RESPONDS
002002  005710                          TST     (R0)
002004  000413                          BR      2$              ;BRANCH IF YES

002006  012737  000006  000004  1$:     MOV     #6,@#4          ;RESTORE TRAP CATCHER
002014  005037  000006                  CLR     @#6             ;RESTORE TRAP CATCHER
002020  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
002022  104401  041312                  TYPE    ,MSG6           ;DEVICE DOES NOT RESPOND; TRAPS TO 4
002026  104401  041202          4$:     TYPE    ,MSG4           ;?INVALID ENTRY, TRY AGAIN
002032  000756                          BR      3$              ;WAIT FOR ANS
```

```
                                ;////////////////////////////////////////////////////////////////////////
                                ;UBE OLD INITIALIZE ROUTINE
                                ;////////////////////////////////////////////////////////////////////////

002156  012737  002172  000004  QUBEO:  MOV     #1$,@#4         ;SET UP FOR TIME OUTS
002164  005737  170000          TST     @#170000        ;SEE IF DATA BUFFER RESPONDS
002170  000405                  BR      2$
002172  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
002174  104401  041312                  TYPE    ,MSG6           ;DEVICE DOESN'T RESPOND
002200  000137  001726                  JMP     Q1              ;GO CHOOSE ANOTHER DEVICE

002204  012737  170006  001212  2$:     MOV     #170006,CREG1   ;SAVE THE GO ADDRESS
002212  012737  034224  001230          MOV     #FAKE,EAD       ;SETUP FAKE ADDRESS FOR ERROR TEST
002220  012737  034174  001232          MOV     #HUBEO,SETUP    ;LOAD PTER FOR UBE HANDLER
002226  000137  003056                  JMP     START1          ;GO TO BEGINNING OF TEST

                                ;////////////////////////////////////////////////////////////////////////
                                ;RK05 QUESTION AND INITIALIZE ROUTINE
                                ;////////////////////////////////////////////////////////////////////////

002232  012737  002246  000004  QRK05:  MOV     #1$,@#4         ;SET UP FOR TIME OUTS
002240  005737  177404          TST     @#RKCS          ;SEE IF RK05 STATUS REG RESPONDS
002244  000405                  BR      2$

002246  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
002250  104401  041312                  TYPE    ,MSG6           ;DEVICE DOES NOT RESPOND
002254  000137  001726                  JMP     Q1              ;GO CHOOSE ANOTHER DEVICE

002260  104401  041414          2$:     TYPE    ,MSG7           ;WHICH DRIVE SHOULD BE USED?
```



```
                                                        ;TYPE 0-7 <CARRIAGE RETURN>
002264  104410                  4$:     RDOCT                   ;WAIT FOR ANS
002266  012600                          MOV     (SP)+,R0        ;IS DRIVE VALID # = OR >0?
002270  002003                          BGE     3$              ;BRANCH IF YES
002272  104401  041202          5$:     TYPE    ,MSG4           ;INVALID ENTRY, TRY AGAIN
002276  000772                          BR      4$              ;GO WAIT FOR REPLY

002300  022700  000010          3$:     CMP     #10,R0          ;IS DRIVE VALID # <7?
002304  003772                          BLE     5$              ;BRANCH IF NO
002306  012701  000015                  MOV     #15,R1          ;PUT DRIVE #
002312  006300                  6$:     ASL     R0              ;IN 3 MSB OF R0
002314  077102                          SOB     R1,6$           ;LOOP TILL DONE
002316  010037  001214                  MOV     R0,@#CREG2      ;SAVE DISK ADDRESS REG CONTENTS WITH SELECTED
                                                                ;DRIVE AND CYLINDER ADDR, SURFACE & SECTOR=0
002322  012737  177404  001212          MOV     #RKCS,CREG1     ;SAVE THE GO ADDRESS
002330  012737  177404  001230          MOV     #RKCS,EAD       ;SAVE THE ERROR ADDRESS
002336  012737  034226  001232          MOV     #HRK05,SETUP    ;LOAD POINTER FOR RK05 HANDLER
002344  013737  001214  177412          MOV     @#CREG2,@#RKDA  ;SET UP DRIVE #
002352  012737  000015  177404          MOV     #15,@#RKCS      ;RESET DRIVE
002360  005001                          CLR     R1              ;INIT COUNT
002362  032737  000100  177400  8$:     BIT     #100,@#RKDS     ;DRIVE READY?
002370  001006                          BNE     7$              ;BRANCH IF YES
002372  005201                          INC     R1              ;WAIT FOR
002374  001372                          BNE     8$              ;DRIVE RDY
002376  104401  041645                  TYPE    ,MSG13          ;DEVICE RDY BIT DOES NOT SET
002402  000137  001726                  JMP     Q1              ;GO CHOOSE ANOTHER DEVICE

002406  000137  003056          7$:     JMP     START1          ;GO TO FIRST TEST

                                ;////////////////////////////////////////////////////////////////////////
                                ;RP03 QUESTION AND INITIALIZE ROUTINE
                                ;////////////////////////////////////////////////////////////////////////

002412  012737  002426  000004  QRP03:  MOV     #1$,@#4         ;SETUP FOR TIME OUT
002420  005737  176714                  TST     @#RPCS          ;SEE IF RP03 CONTROL REG RESPONDS
002424  000405                          BR      2$

002426  022626                  1$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
002430  104401  041312                  TYPE    ,MSG6           ;DEVICE DOES NOT RESPOND
002434  000137  001726                  JMP     Q1              ;GO CHOOSE ANOTHER DEVICE

002440  104401  041414          2$:     TYPE    ,MSG7           ;WHICH DRIVE SHOULD BE USED?
                                                                ;TYPE 0-7 <CARRIAGE RETURN>
002444  104410                  4$:     RDOCT                   ;WAIT FOR REPLY
002446  012600                          MOV     (SP)+,R0        ;GET DRIVE # FROM STACK
002450  002003                          BGE     3$              ;BRANCH IF DRIVE #>OR=0
002452  104401  041202          5$:     TYPE    ,MSG4           ;INVALID ENTRY, TRY AGAIN
002456  000772                          BR      4$              ;GO WAIT FOR REPLY

002460  022703  000010          3$:     CMP     #10,R0          ;IS DRIVE VALID #> OR=7
002464  003772                          BLE     5$              ;BRANCH IF NO
002466  000300                          SWAB    R0              ;PUT DRIVE # IN HIGH BYTE
002470  010037  001214                  MOV     R0,CREG2        ;SETUP CONTROL MASK WITH DRIVE # AND
002474  052737  000004  001214          BIS     #4,CREG2        ;A READ OPERATION (NPR DATO)
002502  005037  176722                  CLR     @#RPCA          ;SETUP CYLINDER ADDRESS REG FOR 0
002506  005037  176724                  CLR     @#RPDA          ;SETUP DISK ADDRESS REG FOR 0 SECTOR AND TRACK
```

```
                                        MOV     #RPCS,CREG1     ;SAVE THE GO ADDRESS
                                        MOV     #RPCS,EAD       ;SAVE THE ERROR ADDRESS
                                        MOV     #HRP03,SETUP    ;LOAD POINTER TO RP03 HANDLER
                                        JMP     START1          ;GO TO FIRST TEST

                                ;////////////////////////////////////////////////////////////////////
                                        ;TU10 QUESTION AND INITIALIZE ROUTINE
                                ;////////////////////////////////////////////////////////////////////

                                QTU10:  MOV     #1$,@#4         ;SETUP FOR TIME OUT
                                        TST     @#MTC           ;SEE IF TU10 COMMAND REG RESPONDS
                                        BR      2$              ;YES, BRANCH

                                1$:     CMP     (SP)+,(SP)+     ;RESTORE STACK
                                        TYPE    ,MSG6           ;DEVICE DOES NOT RESPOND
                                        JMP     Q1              ;GO CHOOSE ANOTHER DEVICE

                                2$:     TYPE    ,MSG7           ;WHICH DRIVE SHOULD BE USED?
                                                                ;TYPE 0-7 <CARRIAGE RETURN>
                                4$:     RDOCT                   ;WAIT FOR REPLY
                                        MOV     (SP)+,R0        ;GET DRIVE # FROM STACK
                                        BGE     3$              ;BRANCH IF DRIVE # > OR = 0
                                5$:     TYPE    ,MSG4           ;INVALID ENTRY TRY AGAIN
                                        BR      4$              ;WAIT FOR REPLY

                                3$:     CMP     #10,R0          ;IS DRIVE VALID # < OR = 7
                                        BLE     5$              ;BRANCH IF NO
                                        SWAB    R0              ;PUT DRIVE # IN HIGH BYTE
                                        MOV     #10000,@#MTC    ;POWER CLEAR CONTROLLER
                                        MOV     #10,R1          ;SET DELAY FOR POWER CLEAR
                                6$:     SOB     R1,6$           ;WAIT FOR POWER CLEAR
                                        MOV     #16,@#MTC       ;SET UP TO REWIND
                                        BIS     R0,@#MTC        ;SET UP DRIVE # IN CONTROL
                                        MOV     #777,R1         ;SET UP DELAY COUNT
                                7$:     SOB     R1,7$           ;DELAY FOR SELECT REMOTE
                                        BIT     #100,@#MTS      ;SEE IF DRIVE SELECTED
                                        BNE     8$              ;BRANCH IF YES
                                        TYPE    ,MSG10          ;DRIVE NOT SELECTED PROPERLY
                                        BR      5$              ;SELECT ANOTHER

                                8$:     BIT     #4,@#MTS        ;WRITE PROTECT ON?
                                        BEQ     9$              ;BRANCH IF NO
                                        TYPE    ,MSG11          ;WRITE PROTECT ON
                                        BR      5$              ;SELECT ANOTHER UNIT

                                9$:     INC     @#MTC           ;REWIND TAPE
                                10$:    BIT     #1,@#MTS        ;TAPE UNIT RDY?
                                        BEQ     10$             ;LOOP TILL IS
                                        MOV     #HTU10,SETUP    ;LOAD PTER TO TU10 HANDLER
                                        MOV     #MTC,CREG1      ;SAVE GO ADDRESS
                                        MOV     #MTC,EAD        ;SAVE ERROR ADDRESS
                                        MOV     #40000,CREG2    ;SET UP CONTROL MASK WITH DENSITY=800BPI, 7 CHANNEL
                                        BIS     R0,CREG2        ;SET DRIVE # IN MASK

                                        ;NOW WRITE MIN # OF BYTES ON TAPE (24)8
```



```
                                        MOV     CREG2,@#MTC     ;SET UP TO DO WRITE
                                        BIS     #4,@#MTC        ;SET FUNCTION=WRITE
                                        MOV     #-20,@#MTBRC    ;WRITE (20)8 BYTES
                                        MOV     #BUFL,@#MTCMA   ;SETUP ADDRESS FOR XFER
                                        INC     @#MTC           ;START WRITE
                                        MOV     #177777,R1      ;SET UP FOR MAX DELAY
                                12$:    BIT     #1,@#MTS        ;UNIT DONE?
                                        BNE     11$             ;BRANCH IF YES
                                        SOB     R1,12$          ;LOOP TILL MAX COUNT DONE
                                        TYPE    ,MSG13          ;DEVICE RDY BIT DOES NOT SET
                                        JMP     Q2              ;TRY ANOTHER DEVICE

                                11$:    TST     @#MTC           ;ERROR BIT SET?
                                        BPL     START1          ;BRANCH IF NO TO FIRST TEST
                                        TYPE    ,MSG12          ;DEVICE ERROR BIT SET
                                        JMP     Q2              ;TRY ANOTHER DEVICE

                                START1: MOV     #UT4,@#4        ;SETUP FOR UNEXPECTED TRAPS TO VECTOR 4
                                        MOV     #UPERR,@#114    ;SET UP FOR UNEXPECTED PARITY ERRORS.
                                        BIC     #1,@#MMR0       ;KT OFF IF ON
                                        MOV     #STACK,SP       ;INIT STACK POINTER

                                        MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
                                        MED                     ;GET CONTENTS OF LOG REG
                                        .WORD   RLOG
                                        BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
                                        MED                     ;UNLOCK ERROR LOG
                                        .WORD   WLOG
                                        MOV     (SP)+,R0        ;RESTORE R0

                                        CMP     SETUP,#HUBEN    ;IS THERE A UNIBUS EXERCISER DEVICE?
                                        BNE     1$              ;BRANCH IF NO
                                        MOV     IVEC,$TMP0      ;GET ITS VECTOR
                                        ADD     #2,$TMP0        ;AND PUT A TRAP
                                        MOV     $TMP0,@IVEC     ;CATCHER THERE
                                        CLR     @$TMP0
                                1$:

                                ;;*****************************************************************
                                ;*TEST 1         TEST PA MUX AND PHYSICAL ADDRESS DRIVERS
                                ;*
                                ;*IF THE INHIBIT TESTS USING KT SWITCH (SW12)=1, THIS
                                ;*TEST IS INHIBITED.
                                ;*    THF PHYSICLAL ADDRESS LINES A17,A16,A15 ARE CHECKED
                                ;*THAT THEY CAN CHANGF STATES.  THE MEMORY IS FIRST SIZED
                                ;*TO SEE IF THERE IS MORE THAN 16K OF MEMORY.  IF NO, THIS
                                ;*TEST IS SKIPPED.  IF THERF IS MORE THAN 16K OF
                                ;*MEMORY, THE HIGH ADDRESS BITS A17, A16, A15 WILL BE TESTED
                                ;*WITH A FLOAT 1, 0 PATTERN.
                                ;*    WHEN AN ADDRESS IS FOUND TO CONTAIN INCORRECT DATA
                                ;*AN ERROR MESSAGE IS TYPED.  IN ADDITION, A HANDLER (NSSYN)
                                ;*FOR TRAPS TO VECTOP 4 WILL REPORT OTHER ADDRESSING ERRORS.

                                ;;*****************************************************************
                                TST1:   MOV     #214,@#CCR      ;TURN OFF CACHE FOR SCOPE
```

```
  897  003170  000004                        .SCOPE
  898  003172  012737  004164  001234        MOV     #TST2,.SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
  899  003200  032777  010000  175726        BIT     #SW12,@.SWR     ;INHIBIT TESTS USING KT?
  900  003206  001402                        BEQ     A15             ;BRANCH IF NO
  901  003210  000137  004164                JMP     TST2            ;YES,GO TO NEXT TEST
  902  003214  012737  004072  000004  A15:  MOV     #NSSYN,@#4      ;SET UP FOR TRAPS TO 4 DUE TO ADDRESSING ERRORS
  903
  904                                        ;START CHECK OF NON PROGRAM LOCATIONS
  905
  906  003222  052737  000200  036034        BIS     #200,@#.KT11    ;TURN ON KT FOR .SIZE
  907  003230  004737  035750                JSR     PC,.SIZE        ;SIZE MEMORY
  908  003234  022737  001000  036322        CMP     #1000,.LSTBK    ;IS THERE MORE THAN 16K OF MEM?
  909  003242  003402                        BLE     A16             ;BRANCH IF YES
  910  003244  000137  004054                JMP     A17             ;NO,GO  EXIT TEST
  911  003250  012700  100000        A16:    MOV     #100000,R0      ;SET UP R0 TO ADDRESS PAR4
  912  003254  012701  077000                MOV     #77000,R1       ;INITIALIZE TEST DATA REG
  913  003260  012737  077406  172310        MOV     #77406,@#KIPDR4 ;PAGE LENGTH=4K, EXPAND UP READ/WRITE
  914  003266  012737  001000  172350        MOV     #1000,@#KIPAR4  ;SET UP TO TEST ADDRESS BIT 15
  915  003274  005237  177572                INC     @#MMR0          ;TURN ON KT
  916  003300  023737  036322  172350  A5:   CMP     .LSTBK,@#KIPAR4 ;TESTED ALL ADDRESSES?
  917  003306  001401                        BEQ     A3              ;BRANCH IF AT LAST ONE
  918  003310  101411                        BLOS    A4              ;BRANCH IF PAST LAST ADDRESS
  919
  920                                        ;SAVE CONTENTS OF ADDRESSES TESTING ON STACK AND PUT TEST DATA IN THEM
  921
  922  003312  011046                 A3:    MOV     (R0),-(SP)      ;SAVE DATA
  923  003314  010110                        MOV     R1,(R0)         ;WRITE TEST DATA IN LOC
  924  003316  005201                        INC     R1              ;CALC NEW TEST DATA
  925  003320  006337  172350                ASL     @#KIPAR4        ;CALC NEXT TEST ADDRESS
  926  003324  005737  172350                TST     @#KIPAR4        ;AT LAST ADDRESS?
  927  003330  001401                        BEQ     A4              ;GO TEST DATA IF PAST LAST ADDR.
  928  003332  000762                        BR      A5              ;GO SEE IF ADDR. TO BE TESTED
  929
  930                                        ;SEE IF DATA AT ADDRESSES
  931
  932  003334  012701  077000        A4:     MOV     #77000,R1       ;INIT. TEST DATA REG
  933  003340  012737  001000  172350        MOV     #1000,@#KIPAR4  ;INIT PAR FOR LOWEST ADDR.
  934  003346  023737  036322  172350  A8:   CMP     .LSTBK,@#KIPAR4 ;LOOKED AT LAST ADDRESS?
  935  003354  001401                        BEQ     A6              ;BRANCH IF AT LAST
  936  003356  101474                        BLOS    A77             ;BRANCH IF PAST ADDRESS
  937  003360  020110                 A6:    CMP     R1,(R0)         ;WAS DATA IN LOC?
  938  003362  001007                        BNE     A1              ;BRANCH IF NO TO ERROR
  939  003364  005201                        INC     R1              ;CALC. TEST DATA
  940  003366  006337  172350                ASL     @#KIPAR4        ;CALC. NEXT TEST LOC.
  941  003372  005737  172350                TST     @#KIPAR4        ;AT LAST ADDR.?
  942  003376  001464                        BEQ     A77             ;BRANCH IF DONE WITH HIGH ADDR.
  943  003400  000762                        BR      A8              ;LOOK AT NEXT LOCATION
  944
  945  003402  011037  001164          A1:   MOV     (R0),.REG3      ;SAVE BAD DATA
  946
  947                                        ;ROUTINE TO CONVERT VIRTUAL ADDRESS IN R0 TO PHYSICAL ADDRESS IN R4,R5
  948
  949  003406  010002                        MOV     R0,R2           ;GET VIRTUAL ADDRESS
  950  003410  005003                        CLR     R3              ;INIT SHIFT COUNTER
  951  003412  006202                  1$:   ASR     R2              ;SHIFT BLOCK NO. TO LSB 0-6
  952  003414  005203                        INC     R3              ;COUNT SHIFTS
```



```
  953  003416  020327  000006                CMP     R3,#6           ;ALL DONE?
  954  003422  001373                        BNE     1$              ;BRANCH IF NO
  955  003424  010204                        MOV     R2,R4           ;SAVE BLOCK #
  956  003426  042704  177600                BIC     #177600,R4      ;CALC. BLOCK #
  957  003432  006202                  2$:   ASR     R2              ;SHIFT ACTIVE PAGE FIELD TO LSB 1-3
  958  003434  005203                        INC     R3              ;COUNT SHIFTS
  959  003436  020327  000014                CMP     R3,#14          ;ALL DONE?
  960  003442  001373                        BNE     2$              ;BRANCH IF NO
  961  003444  042702  177761                BIC     #177761,R2      ;CALC. APFX2
  962  003450  062702  172340                ADD     #KIPAR0,R2      ;CALC. ADDR. OF PAR REFERENCING
  963  003454  011202                        MOV     (R2),R2         ;GET (PAR)
  964  003456  060204                        ADD     R2,R4           ;CALC. PHYSICAL BLOCK #
  965  003460  010405                        MOV     R4,R5           ;START TO SAVE PHYSICAL ADDR. A17,A16
  966  003462  005003                        CLR     R3              ;INIT. SHIFT COUNTER
  967  003464  006205                  3$:   ASR     R5              ;SHIFT ADDR BIT 17,16 TO LSB 0,1
  968  003466  005203                        INC     R3              ;COUNT
  969  003470  020327  000012                CMP     R3,#12          ;DONE?
  970  003474  001373                        BNE     3$              ;BRANCH IF NO
  971  003476  005003                        CLR     R3              ;INIT SHIFT COUNTER
  972  003500  006304                  4$:   ASL     R4              ;SHIFT MSB TO BIT 16
  973  003502  005203                        INC     R3              ;COUNT
  974  003504  020327  000006                CMP     R3,#6           ;ALL DONE?
  975  003510  001373                        BNE     4$              ;BRANCH IF NO
  976  003512  010002                        MOV     R0,R2           ;GET VIRTUAL ADDRESS
  977  003514  042702  177700                BIC     #177700,R2      ;LEAVE BLOCK COUNT IN REG
  978  003520  060204                        ADD     R2,R4           ;HAVE R4 CONTAIN PHY. ADDR. 0-15
  979  003522  010437  001162                MOV     R4,.REG2        ;SAVE LO ADD
  980  003526  010537  001160                MOV     R5,.REG1        ;SAVE HI ADD
  981  003532  010137  001166                MOV     R1,.REG4        ;SAVE CURRENT DATA
  982  003536  012706  001100                MOV     # .STACK,SP     ;RESTORE STACK IF LOOP
  983  003542  104020                        ERROR   20              ;ERROR: PHYSICAL ADDRESS LINE ERROR
  984                                        ;       ADDRESS HELD WRONG DATA
  985  003544  000137  004054                JMP     A17             ;GO TO NEXT TEST
  986
  987                                        ;RESTORE FLOATING '1' ADDRESSES
  988
  989  003550  012737  004000  172350  A77:  MOV     #4000,@#KIPAR4  ;INIT. KIPAR1 TO RESTORE 3 LOC
  990  003556  012700  100000                MOV     #100000,R0      ;INIT R0 TO ADDRESS KIPAR4
  991  003562  022737  004000  036322        CMP     #4000,@#.LSTBK  ;WERE 3 LOC WRITTEN?
  992  003570  101405                        BLOS    A80             ;BRANCH IF YES
  993  003572  022737  002000  036322        CMP     #2000,@#.LSTBK  ;WERE 2 LOC WRITTEN?
  994  003600  101402                        BLOS    A81             ;BRANCH IF YES
  995  003602  000405                        BR      A82             ;RESTORE LAST LOC ONLY
  996  003604  012610                 A80:   MOV     (SP)+,(R0)      ;
  997  003606  012737  002000  172350  A81:  MOV     #2000,@#KIPAR4  ;SET UP KIPAR4 TO RESTORE 2 LOC
  998  003614  012610                        MOV     (SP)+,(R0)
  999  003616  012737  001000  172350  A82:  MOV     #1000,@#KIPAR4  ;SET UP KIPAR4 TO RESTORE LAST LOC
 1000  003624  012610                        MOV     (SP)+,(R0)
 1001
 1002                                        ;NOW TEST ADDRESS 15,16,17 CAN FLOAT A '0'
 1003
 1004  003626  022737  003740  036322        CMP     #3740,.LSTBK    ;ENOUGH MEM TO TEST A17?
 1005  003634  003107                        BGT     A17             ;BRANCH IF NO
 1006  003636  012701  177000                MOV     #177000,R1      ;SET UP TEST DATA
 1007  003642  012700  103776                MOV     #103776,R0      ;ADDR. PAR4 & HAVE ALL LOW ADDRESS BITS=1
 1008  003646  012737  003740  172350        MOV     #3740,@#KIPAR4  ;SET UP PAR4 SO A17=0 A16,A15=1 & ALL HIGH ADDR. BITS =1
```

```
1009  003654  011046                          MOV     (R0),-(SP)      ;SAVE DATA ON STACK
1010  003656  010110                          MOV     R1,(R0)         ;LOAD TEST ADDRESS WITH DATA
1011  003660  005201                          INC     R1              ;CHANGE DATA
1012  003662  022737  005740  036322          CMP     # 5740,$LSTBK   ;ENOUGH MEM TO TEST A16?
1013  003670  003006                          BGT     A10             ;BRANCH IF NO
1014  003672  012737  005740  172350          MOV     # 5740,@#KIPAR4 ;HAVE A17,A16,A15=101
1015  003700  011046                          MOV     (R0),-(SP)      ;SAVE DATA
1016  003702  010110                          MOV     R1,(R0)         ;LOAD TEST DATA
1017  003704  005201                          INC     R1              ;CHANGE DATA
1018
1019  003706  022737  006740  036322  A10:    CMP     # 6740,$LSTBK   ;ENOUGH MEM TO TEST A15?
1020  003714  003005                          BGT     A12             ;BRANCH IF NO
1021  003716  012737  006740  172350          MOV     # 6740,@#KIPAR4
1022  003724  011046                          MOV     (R0),-(SP)      ;SAVE DATA
1023  003726  010110                          MOV     R1,(R0)         ;LOAD TEST DATA
1024
1025                                          ;SEE IF DATA WRITTEN PROPERLY
1026
1027  003730  012737  003740  172350  A12:    MOV     # 3740,@#KIPAR4 ;SET UP ADDRESS
1028  003736  012701  177000                  MOV     #177000,R1
1029  003742  020110                          CMP     R1,(R0)         ;DATA OK?
1030  003744  001402                          BEQ     A11             ;BRANCH IF YES
1031  003746  000137  003402                  JMP     A1              ;REPORT ERROR
1032
1033  003752  022737  005740  036322  A11:    CMP     # 5740,$LSTBK   ;TESTING A16?
1034  003760  003034                          BGT     A14             ;BRANCH IF NO TO RESTORE DATA
1035  003762  005201                          INC     R1              ;UPDATE DATA
1036  003764  012737  005740  172350          MOV     # 5740,@#KIPAR4 ;SETUP ADDRESS
1037  003772  020110                          CMP     R1,(R0)         ;DATA OK?
1038  003774  001402                          BEQ     A13             ;BRANCH YES
1039  003776  000137  003402                  JMP     A1              ;REPORT ERROR
1040
1041  004002  022737  006740  036322  A13:    CMP     # 6740,$LSTBK   ;TESTING A15?
1042  004010  003014                          BGT     A85             ;BRANCH NO TO RESTORE DATA
1043  004012  005201                          INC     R1              ;UPDATE DATA
1044  004014  012737  006740  172350          MOV     # 6740,@#KIPAR4 ;SETUP ADDRESS
1045  004022  020110                          CMP     R1,(R0)         ;DATA OK?
1046  004024  001402                          BEQ     A86             ;BRANCH YES
1047  004026  000137  003402                  JMP     A1              ;REPORT ERROR
1048
1049                                          ;RESTORE DATA
1050
1051  004032  012610                  A86:    MOV     (SP)+,(R0)      ;RESTORE 3 LOCS
1052  004034  012737  005740  172350          MOV     # 5740,@#KIPAR4
1053  004042  012610                  A85:    MOV     (SP)+,(R0)      ;RESTORE 2 LOCS
1054  004044  012737  003740  172350          MOV     # 3740,@#KIPAR4
1055  004052  012610                  A14:    MOV     (SP)+,(R0)      ;RESTORE 1 LOC
1056
1057                                          ;EXIT TEST
1058
1059  004054  042737  000001  177572  A17:    BIC     #1,@#MMR0       ;TURN OFF KT IF ON
1060  004062  012737  033352  000004          MOV     #UT4,@#4        ;RESTORE HANDLER FOR UNEXPECTED TRAPS
1061  004070  000435                          BR      TST2            ;;GO TO NEXT TEST
1062
1063                                  ;ROUTINE TO HANDLE NO SSYN ERRORS
1064
```



```
1065  004072  010046                  NSSYN:  MOV     R0,-(SP)
1066  004074  076600                  18:     MED
1067  004076  000101                          .WORD   HIADD
1068  004100  010037  001160                  MOV     R0,@#$REG1
1069  004104  076600                          MED
1070  004106  000102                          .WORD   LOADD
1071  004110  010037  001162                  MOV     R0,@#$REG2
1072  004114  012600                          MOV     (SP)+,R0
1073  004116  022626                          CMP     (SP)+,(SP)+
1074  004120  013737  177744  001164          MOV     @#EREG,@#$REG3
1075  004126  104021                          ERROR   21              ;ERROR: TRAP TO VECTOR 4  WHEN TESTING PHYSICAL ADDR, LI
1076  004130  012737  033352  000004          MOV     #UT4,@#4        ;RESTORE HANDLER FOR UNEXPECT. TRAPS
1077  004136  042737  000001  177572          BIC     #1,@#MMR0       ;TURN OFF KT
1078
1079  004144  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
1080  004146  076600                          MED                     ;GET CONTENTS OF LOG REG
1081  004150  000022                          .WORD   RLOG
1082  004152  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
1083  004156  076600                          MED                     ;UNLOCK ERROR LOG
1084  004160  000222                          .WORD   WLOG
1085  004162  012600                          MOV     (SP)+,R0        ;RESTORE R0
1086
1087
1088
1089                                  ;;*************************************************************
1090                                  ;*TEST 2        TEST CACHE CAN BE TURNED OFF AND HIT REG CLEARED
1091                                  ;*
1092                                  ;*   THE CACHE IS TURNED OFF AND THE CACHE CONTROL REG
1093                                  ;*IS CHECKED TO CONTAIN ALL 1'S FOR ALL SETTABLE BITS
1094                                  ;*EXCEPT BIT6 (WWP),NEXT THE HIT REG (HMR) IS TESTED TO BE ALL 0'S.  AFTER THIS,
1095                                  ;*A LOW CACHE ADDRESS AND THEN A HIGH ADDRESS ARE TRIED TO
1096                                  ;*BE MADE HITS AND THEN THE HMR IS CHECKED TO BE ALL 0'S.
1097                                  ;*(LOW CACHE ADDRESS HAS PHYSICAL ADDRESS BIT 10=0).
1098                                  ;*
1099                                  ;*IF THIS TEST REPORTS A FATAL ERROR, ALL FOLLOWING TESTS
1100                                  ;*ARE ABORTED
1101
1102                                  ;;*************************************************************
1103  004164  012737  000214  177746  TST2:   MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
1104  004172  000004                          SCOPE
1105  004174  012737  000214  177746          MOV     #214,@#CCR              ;SET UP DATA
1106  004202  012737  004320  001234          MOV     #TST3,$KTST     ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1107  004210  013737  177746  001160          MOV     @#CCR,$REG1     ;GET (CCR)
1108  004216  022737  000214  001160          CMP     #214,@#$REG1    ;WERE BITS SET IN CCR?
1109  004224  001406                          BEQ     T01L01          ;BRANCH IF YES
1110  004226  012737  000214  001162          MOV     #214,$REG2      ;SAVE GOOD DATA
1111  004234  104005                          ERROR   5               ;FATAL ERROR: CACHE CONTROL REG HELD WRONG DATA
1112  004236  000137  033020                  JMP     $EOP            ;ABORT TEST
1113
1114  004242  013737  177752  001160  T01L01: MOV     @#HMR,$REG1     ;SEE IF HIT MISS REG HAS ALL MISSES
1115  004250  001405                          BEQ     T01L02          ;BRANCH IF YES
1116  004252  005037  001162          T01L03: CLR     $REG2           ;SAVE GOOD DATA
1117  004256  104006                          ERROR   6               ;FATAL ERROR;HIT/MISS REG HELD WRONG DATA
1118  004260  000137  033020                  JMP     $EOP            ;ABORT TEST
1119
1120  004264  012700  060000          T01L02: MOV     #BUFL,R0        ;INITIALIZE R0 TO LOW ADDRESS
```

```
1121  004270  021010                          CMP     (R0),(R0)       ;TRY TO MAKE LOC A HIT
1122  004272  013737  177752  001160          MOV     @#HMR,$REG1     ;SEE IF MISS ON LOW ADDRESS SPACE
1123  004300  001364                          BNE     T01L03          ;BRANCH IF GOT FALSE HIT
1124  004302  012700  062000                  MOV     #BUFH,R0        ;SET R0=TO HIGH ADDRESS SPACE
1125  004306  021010                          CMP     (R0),(R0)       ;TRY TO MAKE HIGH ADDRESS A HIT
1126  004310  013737  177752  001160          MOV     @#HMR,$REG1     ;SEE IF MISS AT HIGH ADDRESS
1127  004316  001355                          BNE     T01L03          ;BRANCH IF GET FALSE HIT
1128
1129                                  ;;*****************************************************************
1130                                  ;*TEST 3         TEST CAN GET A HIT ON A HIGH CACHE ADDRESS AND HIT REG CAN =1
1131                                  ;*
1132                                  ;*    THIS IS THE FIRST TEST WHERE THE HIGH HALF OF CACHE IS
1133                                  ;*TURNED ON.  THE CACHE CONTROL REG IS FIRST LOADED AND CHECKED
1134                                  ;*TO CONTAIN THE PROPER VALUE.  THEN ONE LOCATION IN CACHE
1135                                  ;*IS MADE A HIT.  THE HIT REG IS THEN TESTED TO MAKE SURE
1136                                  ;*ITS 5 MSB CAN =1 AT THE CORRECT TIME.
1137                                  ;*
1138                                  ;*IF THIS TEST REPORTS A FATAL ERROR, ALL FOLLOWING TESTS
1139                                  ;*ABORTED.
1140
1141                                  ;;*****************************************************************
1142  004320  012737  000214  177746  TST3:   MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
1143  004326  000004                          SCOPE
1144  004330  012737  004616  001234          MOV     #TST4,$KTST     ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1145  004336  012737  000204  177746          MOV     #204,@#CCR      ;TURN ON HIGH ADDRESSES OF CACHE
1146  004344  013700  177746                  MOV     @#CCR,R0        ;GET (CCR)
1147  004350  022700  000204                  CMP     #204,R0         ;WAS CACHE TURNED ON?
1148  004354  001413                          BEQ     T02L01          ;BRANCH IF YES
1149  004356  042737  000014  177746          BIC     #14,@#CCR       ;TURN CACHE OFF
1150  004364  010037  001160                  MOV     R0,$REG1        ;SAVE BAD DATA
1151  004370  012737  000210  001162          MOV     #210,$REG2      ;SAVE GOOD DATA
1152  004376  104005                  18:     ERROR   5               ;FATAL ERROR: CACHE CONTROL REG HELD WRONG DATA
1153  004400  000137  033020                  JMP     $EOP            ;ABORT TEST
1154
1155  004404  012701  177752          T02L01: MOV     #HMR,R1         ;SAVE HIT/MISS ADDRESS
1156  004410  012700  062000                  MOV     #BUFH,R0        ;INITIALIZE R0 TO HIGH ADDRESS
1157  004414  021010                          CMP     (R0),(R0)       ;MAKE ADDRESS A HIT
1158  004416  011102                          MOV     (R1),R2         ;SAVE HIT-MISS REG SHIFTED ONE
1159  004420  011103                          MOV     (R1),R3         ;SAVE HIT MISS REG SHIFTED TWO
1160  004422  011104                          MOV     (R1),R4         ;SAVE HIT MISS REG SHIFTED THREE
1161  004424  011105                          MOV     (R1),R5         ;SAVE HIT MISS REG SHIFTED FOUR
1162  004426  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE
1163  004434  030227  000002                  BIT     R2,$HMR1        ;DID WE GET A HIT AND WAS IT SHIFTED?
1164  004440  001010                          BNE     T02L02          ;BRANCH IF YES
1165  004442  010237  001160                  MOV     R2,@$REG1       ;SAVE BAD DATA
1166  004446  012737  000002  001162          MOV     #2,@$REG2       ;SAVE GOOD DATA
1167  004454  104013                  T02L06: ERROR   13              ;FATAL ERROR:HIT/MISS REG HELD WRONG DATA
1168  004456  000137  033020                  JMP     $EOP            ;ABORT TEST
1169
1170  004462  030327  000004          T02L02: BIT     R3,$HMR2        ;WAS DATA SHIFTED?
1171  004466  001006                          BNE     T02L03          ;BRANCH IF YES
1172  004470  010337  001160                  MOV     R3,@$REG1       ;SAVE BAD DATA
1173  004474  012737  000004  001162          MOV     #4,@$REG2       ;SAVE GOOD DATA
1174  004502  000764                          BR      T02L06          ;REPORT ERROR
1175
1176  004504  030427  000010          T02L03: BIT     R4,$HMR3        ;WAS DATA SHIFTED?
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```
1177  004510  001006                          BNE     T02L04          ;BRANCH IF YES
1178  004512  010437  001160                  MOV     R4,@$REG1       ;SAVE BAD DATA
1179  004516  012737  000010  001162          MOV     #10,@$REG2      ;SAVE GOOD DATA
1180  004524  000753                          BR      T02L06          ;REPORT ERROR
1181
1182  004526  030527  000020          T02L04: BIT     R5,$HMR4        ;WAS DATA SHIFTED?
1183  004532  001006                          BNE     T02L05          ;BRANCH IF YES
1184  004534  010537  001160                  MOV     R5,@$REG1       ;SAVE BAD DATA
1185  004540  012737  000020  001162          MOV     #20,@$REG2      ;SAVE GOOD DATA
1186  004546  000742                          BR      T02L06          ;REPORT ERROR
1187
1188  004550  012737  000204  177746  T02L05: MOV     #204,@#CCR      ;TURN HALF CACHE ON
1189  004556  021010                          CMP     (R0),(R0)       ;MAKE ADDRESS A HIT
1190  004560  021010                          CMP     (R0),(R0)       ;SHIFT HIT 3 TIMES
1191  004562  000240                          NOP                     ;SHIFT HIT FOURTH TIME
1192  004564  011102                          MOV     (R1),R2         ;SHIFT HIT FIFTH TIME AND SAVE

1193  004566  030227  000040                  BIT     R2,$HMR5        ;WAS DATA SHIFTED?
1194  004572  001011                          BNE     TST4            ;;BRANCH IF YES TO NEXT TEST
1195  004574  052737  000014  177746          BIS     #14,@#CCR       ;TURN CACHE OFF
1196  004602  010237  001160                  MOV     R2,@$REG1       ;SAVE BAD DATA
1197  004606  012737  000054  001162          MOV     #54,@$REG2      ;SAVE GOOD DATA
1198  004614  000717                          BR      T02L06          ;REPORT ERROR
1199
1200                                  ;;*****************************************************************
1201                                  ;*TEST 4         TEST FORCE MISS ON HIGH ADDRESS
1202                                  ;*
1203                                  ;*A LOCATION IS PUT IN CACHE. CACHE IS THEN TURNED OFF
1204                                  ;*AND THE LOCATION IS CHECKED TO BE A MISS.
1205
1206                                  ;;*****************************************************************
1207  004616  012737  000214  177746  TST4:   MOV     #214,@#CCR      ;TURN OFF CACHE FOR SCOPE
1208  004624  000004                          SCOPE
1209  004626  012737  004712  001234          MOV     #TST5,$KTST     ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1210  004634  012737  000204  177746          MOV     #204,@#CCR      ;TURN ON HIGH ADDRESS OF CACHE
1211  004642  012700  062000                  MOV     #BUFH,R0        ;INITIALIZE R0=HIGH ADDRESS
1212  004646  021010                          CMP     (R0),(R0)       ;MAKE LOC A HIT
1213  004650  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE
1214  004656  005710                          TST     (R0)            ;SEE IF LOC STILL A HIT
1215  004660  033727  177752  000004          BIT     @#HMR,$HMR2     ;WAS IT A MISS?
1216  004666  001411                          BEQ     TST5            ;;BRANCH IF YES
1217  004670  013737  177746  001160          MOV     @#CCR,$REG1     ;SAVE (CCR)
1218  004676  012737  000000  001162          MOV     #0,@$REG2       ;SAVE PHYSICAL ADDRESS HIGH
1219  004704  010037  001164                  MOV     R0,$REG3        ;SAVE PHYSICAL ADDRESS LOW
1220  004710  104012                  1$:     ERROR   12              ;ERROR:FORCE MISS BIT FAILED TO CAUSE MISS.
1221
1222
1223                                  ;;*****************************************************************
1224                                  ;*TEST 5         TEST CACHE TRACKS WHEN CACHE IS OFF
1225                                  ;*
1226                                  ;*    A LOC IS MADE A HIT IN CACHE. CACHE IS THEN TURNED OFF
1227                                  ;*AND A SECOND LOC IS REFERENCED WHICH HAS AN OVERLAPPING
1228                                  ;*CACHE ADDRESS WITH THE FIRST ONE.  CACHE IS TURNED ON
1229                                  ;*AND THE SECOND LOC IS TESTED TO BE A HIT (IMPLYING
1230                                  ;*CACHE HAS TRACKED).
1231
1232                                  ;;*****************************************************************
```

```
1233  004712  012737  000214  177746  TST5:   MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
1234  004720  000004                  SCOPE
1235  004722  012737  005044  001234          MOV     #TST6,SKTST     ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1236  004730  012737  000204  177746          MOV     #204,@#CCR      ;HALF CACHE ON
1237  004736  023737  002000  002000          CMP     @#2000,@#2000           ;PUT DATA IN CACHE
1238  004744  033727  177752  000004          BIT     @#HMR,#HMR2     ;DATA IN CACHE?
1239  004752  001423                          BEQ     1$              ;BRANCH IF NO TO ERROR
1240  004754  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
1241  004762  005737  062000                  TST     @#BUFH          ;REFERENCE LOC NOT IN CACHE AND SEE IF TRACK
1242  004766  012737  000204  177746          MOV     #204,@#CCR      ;HALF CACHE ON
1243  004774  005737  062000                  TST     @#BUFH          ;SEE IF CACHE TRACKED
1244  005000  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT?
1245  005006  001016                          BNE     TST6            ;;YES, GO TO NEXT TEST
1246
1247  005010  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
1248  005016  104107                          ERROR   107             ;ERROR: CACHE DID NOT TRACK WHEN FORCE MISS ON
1249  005020  000411                          BR      TST6            ;;GO TO NEXT TEST
1250
1251  005022  052737  000014  177746  1$:     BIS     #14,@#CCR       ;CACHE OFF
1252  005030  005037  001160                  CLR     $REG1           ;SAVE BAD ADDR.
1253  005034  012737  002000  001162          MOV     #2000,$REG2     ;SAVE BAD ADDR.
1254  005042  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
1255
1256                                  ;;**************************************************************
1257                                  ;*TEST 6         TEST DATOB OPERATION
1258                                  ;*
1259                                  ;*   A DATOB IS DONE TO AN ADDRESS NOT IN CACHE AND THEN
1260                                  ;*THE LOC IS REFERENCED TO SEE THAT CACHE WAS NOT ALLOCATED.
1261                                  ;*NEXT A DATOB IS DONE TO AN ODD LOC IN CACHE AND THE
1262                                  ;*CORRECT BYTE IS CHECKED TO BE MODIFIED.  THIS IS RE-
1263                                  ;*PEATED FOR AN EVEN ADDRESS.
1264
1265                                  ;;**************************************************************
1266  005044  012737  000214  177746  TST6:   MOV     #214,@#CCR      ;TURN OFF CACHE FOR SCOPE
1267  005052  000004                  SCOPE
1268  005054  012737  005364  001234          MOV     #TST7,SKTST     ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1269  005062  012737  000204  177746          MOV     #204,@#CCR      ;TURN ON CACHE HIGH ADDRESS
1270  005070  005737  002000                  TST     @#2000          ;MAKE LOC BUFH IN NEXT INST. A MISS
1271  005074  112737  000377  062000          MOVB    #377,@#BUFH     ;DO DATOB TO NON-HIT LOC TO SEE IT DOESN'T GET CACHED
1272  005102  005737  062000                  TST     @#BUFH          ;SEE IF DATA PUT IN CACHE
1273  005106  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS DATA A HIT?
1274  005114  001413                          BEQ     T04L01          ;BRANCH IF NO
1275  005116  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE
1276  005124  012737  000000  001160          MOV     #0,$REG1        ;SAVE PHYSICAL ADDRESS HIGH
1277  005132  012737  062000  001162          MOV     #BUFH,$REG2     ;SAVE NO HIT PHYSICAL ADDRESS LOW
1278  005140  104007                  1$:     ERROR   7               ;ERROR:DATA CACHED ON DATOB TO NO 'HIT' ADD.
1279  005142  000510                          BR      TST7            ;;GO TO NEXT TEST
1280
1281  005144  005037  062000          T04L01: CLR     @#BUFH          ;INITIALIZE LOC BUFH
1282  005150  112737  177777  062001          MOVB    #177777,@#BUFH+1  ;DO DATOB TO A HIT LOC
1283  005156  005737  062000                  TST     @#BUFH          ;SEE IF DATA PUT IN CACHE
1284  005162  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS DATA A HIT ?
1285  005170  001013                          BNE     T04L02          ;BRANCH IF YES
1286  005172  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE
1287  005200  012737  000000  001160          MOV     #0,$REG1        ;SAVE PHYSICAL ADDRESS HIGH
1288  005206  012737  062000  001162          MOV     #BUFH,$REG2     ;SAVE PHYSICAL ADDRESS LOW
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1289  005214  104010                  1$:     ERROR   10              ;ERROR:DATA NOT CACHED ON DATOB TO A 'HIT' LOC.
1290  005216  000462                          BR      TST7            ;;GO TO NEXT TEST
1291
1292  005220  072737  177400  062000  T04L02: CMP     #177400,@#BUFH  ;WAS DATA WRITTEN CORRECTLY?
1293  005226  001424                          BEQ     T04L03          ;BRANCH IF YES
1294  005230  013700  062000                  MOV     @#BUFH,R0       ;GET BAD DATA
1295  005234  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE
1296  005242  012737  000000  001160          MOV     #0,$REG1        ;SAVE PHYSICAL ADDRESS HIGH
1297  005250  012737  062000  001162          MOV     #BUFH,$REG2     ;SAVE PHYSICAL ADDRESS LOW
1298  005256  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
1299  005262  012737  177400  001166          MOV     #177400,$REG4   ;SAVE GOOD DATA
1300  005270  104011                  1$:     ERROR   11              ;ERROR:CACHE DID NOT CONTAIN PROPER DATA ON DATOB
1301  005272  042737  000010  177746          BIC     #10,@#CCR       ;TURN CACHE ON
1302
1303  005300  005037  062000          T04L03: CLR     @#BUFH          ;INITIALIZE LOCATION
1304  005304  112737  000377  062000          MOVB    #377,@#BUFH     ;DO DATOB TO EVEN ADDRESS
1305  005312  022737  000377  062000          CMP     #377,@#BUFH     ;WAS DATA WRITTEN CORRECTLY?
1306  005320  001421                          BEQ     TST7            ;;BRANCH IF YES TO NEXT TEST
1307  005322  013700  062000                  MOV     @#BUFH,R0       ;GET BAD DATA
1308  005326  052737  000014  177746          BIS     #14,@#CCR       ;TURN CACHE OFF
1309  005334  012737  000000  001160          MOV     #0,$REG1        ;SAVE PHYSICAL ADDRESS HIGH
1310  005342  012737  062000  001162          MOV     #BUFH,$REG2     ;SAVE PHYSICAL ADDRESS LOW
1311  005350  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
1312  005354  012737  000377  001166          MOV     #377,$REG4      ;SAVE GOOD DATA
1313  005362  104011                  1$:     ERROR   11              ;ERROR:CACHE DID NOT CONTAIN PROPER DATA ON DATOB.
1314
1315                                  ;;**************************************************************
1316                                  ;*TEST 7         TEST DATO ALLOCATES CACHE
1317                                  ;*
1318                                  ;*   A LOC IS MADE A HIT IN CACHE, THEN A DATO IS DONE TO
1319                                  ;*A SECOND CACHE ADDRESS WITH ADDRESS BITS A0-A10 THE SAME.
1320                                  ;*THE SECOND ADDRESS IS THEN CHECKED TO BE ALLOCATED IN
1321                                  ;*CACHE.
1322
1323                                  ;;**************************************************************
1324  005364  012737  000214  177746  TST7:   MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
1325  005372  000004                  SCOPE
1326  005374  012737  006000  001234          MOV     #TST10,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1327  005402  012737  000204  177746          MOV     #204,@#CCR      ;HALF CACHE ON
1328  005410  023737  002000  002000          CMP     @#2000,@#2000   ;PUT LOC IN CACHE TO MAKE NEXT REF A MISS
1329  005416  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT?
1330  005424  001422                          BEQ     T05L01          ;BRANCH TO ERROR IF NO
1331  005426  005037  062000                  CLR     @#BUFH          ;DO DATO TO A MISS ADDRESS
1332  005432  005737  062000                  TST     @#BUFH          ;LOC IN CACHE?
1333  005436  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT?
1334  005444  001023                          BNE     T05L02          ;;YES, GO TO END OF TEST
1335  005446  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
1336  005454  005037  001160                  CLR     $REG1           ;SAVE FAILING ADDRESS
1337  005460  012737  062000  001162          MOV     #BUFH,$REG2     ;SAVE FAILING ADDRESS
1338  005466  104014                          ERROR   14              ;FRROR:  ADDR. NOT A HIT AFTER DATO TO IT
1339  005470  000411                          BR      T05L02          ;;GO TO END OF TEST
1340
1341  005472  052737  000014  177746  T05L01: BIS     #14,@#CCR       ;CACHE OFF
1342  005500  005037  001160                  CLR     $REG1           ;SAVE FAILING ADDR
1343  005504  012737  002000  001162          MOV     #2000,$REG2     ;SAVE FAILING ADDR
1344  005512  104043                          ERROR   43              ;ERROR: ADDR. COULD NOT BE MADE A HIT
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1345
1346  005514  052737  000014  177746  T05L02: BIS     #14,@#CCR       ;CACHE OFF WHEN CROSS CACHE ADDRESS BOUNDARY
1347  005522  000526                          BR      TST10           ;;GO TO NEXT TEST
1348
1349
1350          006000                          .=6000                  ;ADJUST ADDRESS SPACE FOR NEXT TEST
1351
1352
1353                                  ;;**************************************************************
1354                                  ;*TEST 10        TEST CAN GET HIT AND  FORCE MISS ON LOW CACHE ADDRESS
1355                                  ;*
1356                                  ;*   THIS IS THE FIRST TEST WHERE LOW CACHE IS TURNED
1357                                  ;*ON.  THE CACHE CONTROL REG IS FIRST LOADED AND CHECKED
1358                                  ;*TO CONTAIN THE PROPER VALUE.  THEN ONE LOC IN LOW
1359                                  ;*CACHE IS MADE A HIT.  THE HIT IS CHECKED FOR AND THEN
1360                                  ;*CACHE IS TURNED OFF AND THE LOC IS RETESTED TO NOW BE
1361                                  ;*A MISS.
1362                                  ;*
1363                                  ;*IF THIS TEST REPORTS A FATAL ERROR, ALL FOLLOWING TESTS
1364                                  ;*ARE ABORTED.
1365
1366                                  ;;**************************************************************
1367  006000  012737  000214  177746  TST10:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
1368  006006  000004                          SCOPE
1369  006010  012737  006166  001234          MOV     #TST11,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1370  006016  012737  000210  177746          MOV     #210,@#CCR      ;TURN ON LOW CACHE
1371  006024  013700  177746                  MOV     @#CCR,R0        ;GET (CCR)
1372  006030  022700  000210                  CMP     #210,R0         ;(CCR) OK?
1373  006034  001413                          BEQ     2$              ;BRANCH IF YES
1374  006036  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
1375  006044  010037  001160                  MOV     R0,$REG1        ;SAVE BAD DATA
1376  006050  012737  000210  001162          MOV     #210,$REG2      ;SAVE GOOD DATA
1377  006056  104005                          ERROR   5               ;FATAL ERROR: CCR HELD WRONG DATA
1378  006060  000137  033020                  JMP     $EOP            ;ABORT PROGRAM
1379
1380  006064  012700  060000          2$:     MOV     #BUFL,R0        ;INIT R0=LOW ADDRESS
1381  006070  021010                          CMP     (R0),(R0)       ;MAKE LOC A HIT
1382  006072  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS IT A HIT?
1383  006100  001012                          BNE     4$              ;BRANCH IF YES
1384  006102  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
1385  006110  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
1386  006114  012737  060000  001162          MOV     #BUFL,$REG2     ;SAVE ADDRESS
1387  006122  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
1388  006124  000420                          BR      TST11           ;;GO TO NEXT TEST
1389
1390  006126  052737  000014  177746  4$:     BIS     #14,@#CCR       ;CACHE OFF
1391  006134  005710                          TST     (R0)            ;SEE IF LOC STILL A HIT
1392  006136  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS IT A MISS?
1393  006144  001410                          BEQ     TST11           ;;BRANCH IF YES
1394  006146  013737  177746  001160          MOV     @#CCR,@REG1     ;SAVE (CCR)
1395  006154  005037  001162                  CLR     $REG2           ;SAVE ADDRESS
1396  006160  010037  001164                  MOV     R0,$REG3        ;SAVE ADDRESS
1397  006164  104012                          ERROR   12              ;ERROR: FORCE MISS BIT FAILED TO CAUSE MISS
1398
1399                                  ;;**************************************************************
1400                                  ;*TEST 11        TEST OF TAG ADDRESS COMPARATOR
```



```
1401                                  ;*
1402                                  ;*   THIS TEST USES ONE LOC IN CACHE AND LOADS IT WITH
1403                                  ;*VARIOUS TAG ADDRESSES.  A GROUP OF MEMORY REFERENCES
1404                                  ;*ARE MADE FOR EACH TAG ADDRESS AND IT IS DETERMINED
1405                                  ;*WHETHER EACH REFERENCE WILL BE A HIT OR A MISS.  THE
1406                                  ;*LOW ADDRESS COMPARATOR FOR BITS A11-A14 IS TESTED FIRST.
1407                                  ;*A TAG ADDRESS IS LOADED AND THEN ALL POSSIBLE COMBINATIONS
1408                                  ;*OF MEMORY ADDRESSES TO THAT CHIP ARE MADE.  ALL TAG
1409                                  ;*COMBINATIONS ARE TRIED IN THIS MANNER FOR THESE LOW
1410                                  ;*ADDRESSES.  THE HIGH ADDRESS COMPARATOR FOR BITS A15-
1411                                  ;*A17 IS HELD CONSTANT DURING THIS TIME.  THE SAME PRO-
1412                                  ;*CEDURE IS REPEATED FOR THIS HIGH ADDRESS COMPARATOR
1413                                  ;*WHILE THE LOW ONE IS HELD CONSTANT.  THE COMPARATOR
1414                                  ;*TEST IS LIMITED TO THE MEMORY SIZE AVAILABLE.
1415                                  ;*   KIPAR4 CONTAINS THE TAG ADDRESS BEING TESTED.  KIPAR5
1416                                  ;*CONTAINS THE MEMORY REFERENCE ADDRESS BEING MADE.  IF
1417                                  ;*INHIBIT TESTS USING KT SWITCH IS SET (SW12), THIS TEST
1418                                  ;*IS INHIBITED.
1419
1420                                  ;;**************************************************************
1421  006166  012737  000214  177746  TST11:  MOV     #214,@#CCR              ;TURN OFF CACHE FOR SCOPE
1422  006174  000004                          SCOPE
1423  006176  012737  006626  001234          MOV     #TST12,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1424  006204  032777  010000  172722          BIT     #SW12,@SWR      ;INHIBIT TESTS USING KT?
1425  006212  001402                          BEQ     2$              ;BRANCH IF NO
1426  006214  000137  006626                  JMP     @#TST12         ;GO TO NEXT TEST
1427  006220  052737  000200  036034  2$:     BIS     #200,@#$KT11    ;TURN ON KT FOR MEM SIZING
1428  006226  004737  035750                  JSR     PC,@$SIZE       ;SIZE MEM
1429  006232  012700  172350                  MOV     #KIPAR4,R0      ;SET UP TO
1430  006236  012701  172310                  MOV     #KIPDR4,R1      ;INIT KIPDR4, 5 & KIPAR4, 5
1431  006242  005020                  1$:     CLR     (R0)+           ;FOR TESTING
1432  006244  012721  077406                  MOV     #77406,(R1)+    ;PAGE LENGTH=4K, EXPAND UP, READ/WRITE
1433  006250  020127  172314                  CMP     R1,#KIPDR6      ;KT SET UP?
1434  006254  001372                          BNE     1$              ;BRANCH IF NO
1435  006256  000403                          BR      T06L12          ;GO TO START OF TEST
1436
1437  006260  005737  172352          T06L01: TST     @#KIPAR5        ;PAST MAX PAR5?
1438  006264  001404                          BEQ     T06L03          ;BRANCH IF YES TO CHOOSE NEXT TAG ADDRESS
1439  006266  023737  172352  036322  T06L12: CMP     @#KIPAR5,@#$LSTBK  ;REFERENCED ALL POSSIBLE ADDRS. FOR THIS COMPARATOR?
1440  006274  003434                          BLE     T06L02          ;BRANCH IF NO
1441  006276  023727  172350  001000  T06L03: CMP     @#KIPAR4,#1000  ;TESTED COMPARATOR FOR ADDRESS BITS 15,16,17?
1442  006304  002404                          BLT     T06L05          ;BRANCH IF NO
1443  006306  062737  001000  172350          ADD     #1000,@#KIPAR4  ;TEST NEXT ADDRESS BIT OF HIGH ADDR. COMP.
1444  006314  000403                          BR      T06L06
1445
1446  006316  062737  000040  172350  T06L05: ADD     #40,@#KIPAR4    ;TEST NEXT ADDRESS BIT OF LOW ADDR. COMP.
1447  006324  005737  172350          T06L06: TST     @#KIPAR4        ;PAST MAX TAG ADDRESS?
1448  006330  001533                          BEQ     T06L04          ;GO TO END OF TEST IF YES
1449  006332  023737  172350  036322          CMP     @#KIPAR4,@#$LSTBK  ;HAVE ALL POSSIBLE TAG INPUTS TO COMPARATOR BEEN DONE
1450  006340  002127                          BGE     T06L04          ;GO TO END OF TEST IF YES
1451  006342  023727  172350  001000          CMP     @#KIPAR4,#1000  ;ARE WE TESTING THE HIGH ADDRESS COMPARATOR?
1452  006350  002003                          BGE     T06L07          ;BRANCH IF YES
1453  006352  005037  172352                  CLR     @#KIPAR5        ;INIT PAR5 TO TEST LOW ADDR. COMP.
1454  006356  000403                          BR      T06L07          ;GO TEST COMPARATOR
1455
1456  006360  012737  001000  172352  T06L07: MOV     #1000,@#KIPAR5  ;INIT. PAR5 TO TEST HIGH ADDR. COMP.
```

```
1457  006366  052737  000014  177746  T06L02: BIS     #14,@#CCR       ;TURN CACHE OFF
1458  006374  012737  120000  001172          MOV     #120000,$TMP0   ;START CALC. OF PHYSICAL
1459  006402  004737  033434                  JSR     PC,VIP          ;ADDRESS REFERENCING AND
1460  006406  013700  172350                  MOV     @#KIPAR4,R0     ;START CALC OF TAG ADDRESS TESTING
1461  006412  005001                          CLR     R1              ;GET TAG FIELD TO 7 LSB R0
1462  006414  006200                  1$:     ASR     R0              ;GET TAG FIELD TO 7 LSB R0
1463  006416  005201                          INC     R1              ;GET TAG FIELD TO 7 LSB R0
1464  006420  020127  000005                  CMP     R1,#5           ;GET TAG FIELD TO 7 LSB R0
1465  006424  001373                          BNE     1$              ;GET TAG FIELD TO 7 LSB R0
1466  006426  010037  001164                  MOV     R0,$REG3        ;SAVE TAG IN CASE OF ERROR
1467
1468  006432  052737  000001  177572          BIS     #1,@#MMR0       ;TURN ON KT
1469  006440  012737  000210  177746  T06L08: MOV     #210,@#CCR      ;TURN ON HALF OF CACHE ON
1470  006446  023737  172350  172352          CMP     @#KIPAR4,@#KIPAR5       ;WILL REFERENCE BE A HIT
1471  006454  001422                          BEQ     T06L09          ;BRANCH IF YES
1472  006456  023737  100000  120000          CMP     @#100000,@#120000  ;LOAD ADDRESS IN TAG FIELD & THEN REFERENCE IT
1473  006464  033727  177752  000004          BIT     @#MMR,#MMR2     ;WAS REFERENCE A MISS?
1474  006472  001435                          BEQ     T06L10          ;BRANCH IF YES
1475  006474  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE
1476  006502  012737  006440  001110          MOV     #T06L08,@#$LPERR  ;INIT. FOR LOOP ON ERROR
1477  006510  104022                          ERROR   22              ;ERROR: TEST OF ADDR. COMP. FAILED TO BE MISS
1478  006512  042737  000001  177572          BIC     #1,@#MMR0       ;TURN OFF KT
1479  006520  000442                          BR      TST12           ;;GO TO NEXT TEST
1480
1481  006522  023737  100000  120000  T06L09: CMP     @#100000,@#120000  ;LOAD ADDRESS IN TAG FIELD & THEN REFERENCE IT
1482  006530  033727  177752  000004          BIT     @#MMR,#MMR2     ;WAS REF. A HIT?
1483  006536  001013                          BNE     T06L10          ;BRANCH IF YES
1484  006540  052737  000014  177746          BIS     #14,@#CCR       ;TURN OFF CACHE FOR ERROR REPORT
1485  006546  012737  006440  001110          MOV     #T06L08,@#$LPERR  ;SETUP RETURN FOR LOOP ON ERROR
1486  006554  104023                          ERROR   23              ;ERROR: TEST OF ADDR. COMP. FAILED TO BE HIT
1487  006556  042737  000001  177572          BIC     #1,@#MMR0       ;TURN OFF KT
1488  006564  000420                          BR      TST12           ;;GO TO NEXT TEST
1489
1490  006566  023727  172352  000740  T06L10: CMP     @#KIPAR5,#740   ;REFERENCED ADDRESSES OF LOWER ADDR. COMP.?
1491  006574  001640                          BEQ     T06L03          ;BRANCH IF YES
1492  006576  002404                          BLT     T06L11          ;BRANCH IF PAR5 STILL REF. LOW ADDR. COMP.
1493  006600  062737  001000  172352          ADD     #1000,@#KIPAR5  ;ADDRESS NEXT LOC FOR HIGH ADDR. COMPARATOR
1494  006606  000624                          BR      T06L01          ;SEE IF DONE
1495  006610  062737  000040  172352  T06L11: ADD     #40,@#KIPAR5    ;ADDRESS NEXT LOC FOR LOW ADDR. COMP.
1496  006616  000620                          BR      T06L01          ;SEE IF DONE
1497
1498  006620  042737  000001  177572  T06L04: BIC     #1,@#MMR0       ;TURN KT OFF
1499
1500                                   ;;*************************************************************
1501                                   ;*TEST 12        TEST FORCE MISS LOCKS OUT PARITY ERRORS & CCR WWP CAN =1
1502                                   ;*
1503                                   ;*   THIS IS THE FIRST TEST WHERE WRITE WRONG PARITY AND
1504                                   ;*THE CACHE PARITY TRAP IS EXERCISED.  FIRST THE WWP IS
1505                                   ;*SET AND THE CACHE CONTROL REG IS CHECKED TO CONTAIN THE
1506                                   ;*PROPER VALUE.  A PARITY TRAP IS THEN FORCED AND TESTED
1507                                   ;*FOR.  THE LOCATION IS REWRITTEN WITH WRONG PARITY AND
1508                                   ;*THEN THE CACHE IS TURNED OFF.  THE LOCATION IS REFERENCED
1509                                   ;*AND NO PARITY TRAP WHEN FORCE MISS IS ON IS CHECKED FOR.
1510
1511                                   ;;*************************************************************
1512  006626  012737  000214  177746  TST12:  MOV     #214,@#CCR      ;TURN OFF CACHE
```



```
1513  006634  000004                          SCOPE
1514  006636  012737  007140  001234          MOV     #TST13,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1515  006644  012737  006770  000114          MOV     #T09L01,@#PVEC  ;SETUP PARITY TRAP HANDLER
1516  006652  012737  000310  177746          MOV     #310,@#CCR      ;TURN ON HALF OF CACHE & WWP
1517  006660  013700  177746                  MOV     @#CCR,R0
1518  006664  020027  000310                  CMP     R0,#310         ;WERE BITS SET IN CCR?
1519  006670  001414                          BEQ     T09L02          ;BRANCH IF YES
1520  006672  012737  000014  177746          MOV     #14,@#CCR       ;TURN CACHE OFF
1521  006700  010037  001160                  MOV     R0,$REG1        ;SAVE BAD DATA
1522  006704  012737  000310  001162          MOV     #310,$REG2      ;SAVE GOOD DATA
1523  006712  104026                          ERROR   26              ;ERROR: CACHE CONTROL REG HELD WRONG DATA
1524  006714  012737  000310  177746          MOV     #310,@#CCR      ;TURN ON HALF OF CACHE & WWP
1525
1526  006722  005037  060000          T09L02: CLR     @#BUFL          ;WRITE WRONG PARITY IN 1 LOC
1527  006726  012737  000210  177746          MOV     #210,@#CCR      ;WWP OFF
1528  006734  005737  060000                  TST     @#BUFL          ;SEE IF GET PARITY TRAP
1529
1530
1531                                   ;RID CACHE OF BAD PARITY
1532  006740  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
1533  006746  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
1534
1535
1536  006752  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
1537  006756  012737  060000  001162          MOV     #BUFL,$REG2     ;SAVE ADDRESS
1538  006764  104042                          ERROR   42              ;ERROR: NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PARIT
1539  006766  000450                          BR      T09L06          ;GO TO END OF TEST
1540
1541  006770                          T09L01:
1542
1543                                   ;RID CACHE OF BAD PARITY
1544  006770  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
1545  006776  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
1546
1547
1548
1549  007002  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
1550  007004  076600                          MED                     ;GET CONTENTS OF LOG REG
1551  007006  000022                          .WORD   RLOG
1552  007010  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
1553  007014  076600                          MED                     ;UNLOCK ERROR LOG
1554  007016  000222                          .WORD   WLOG
1555  007020  012600                          MOV     (SP)+,R0        ;RESTORE R0
1556
1557  007022  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
1558  007024  012737  007072  000114          MOV     #T09L03,@#PVEC  ;SET UP PARITY TRAP HANDLER
1559  007032  012737  000310  177746          MOV     #310,@#CCR      ;TURN HALF OF CACHE ON & WWP
1560  007040  005037  060000                  CLR     @#BUFL          ;WRITE WRONG PARITY IN ONE LOC
1561  007044  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
1562  007052  005737  060000                  TST     @#BUFL          ;SEE IF SEE GET PARITY TRAP
1563
1564  007056                          T09L04:
1565
1566                                   ;RID CACHE OF BAD PARITY
1567  007056  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
1568  007064  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
```

```
                                        BR      T09L06          ;GO TO END OF TEST

007072                          T09L03:

                                        ;RID CACHE OF BAD PARITY
007072  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
007100  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE


007104  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
007106  104024                          ERROR   24              ;ERROR: FORCE MISS DID NOT INHIBIT PARITY ERRORS

007110                          T09L06:

007110  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
007112  076600                          MED                     ;GET CONTENTS OF LOG REG
007114  000022                          .WORD   RLOG
007116  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
007122  076600                          MED                     ;UNLOCK ERROR LOG
007124  000222                          .WORD   WLOG
007126  012600                          MOV     (SP)+,R0        ;RESTORE R0

007130  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE HANDLER FOR UNEXPECTED PARITY ERRORS
007136  000400                          BR      TST13           ;;GO TO NEXT TEST


                                ;;*****************************************************************
                                ;*TEST 13        TEST OF TAG PARITY GENERATOR/CHECKER
                                ;*
                                ;*   THIS TEST INITIALLY SIZES MEMORY TO DETERMINE THE
                                ;*MAXIMUM TESTABLE ADDRESS.  KIPAR4 IS SETUP TO WRITE ALL
                                ;*TAG COMBINATIONS UP TO THE MAX ADDRESS INTO ONE CACHE
                                ;*LOCATION.  FIRST, THE LOCATION IS WRITTEN WITH WRONG
                                ;*PARITY FOR ALL THE TAG COMBINATIONS AND A PARITY TRAP
                                ;*IS FORCED AND TESTED FOR.  AFTER EACH TRAP, THE PROGRAM
                                ;*CHECKS THAT THE TRAP WAS FROM THE TAG FIELD AND THAT
                                ;*THE TAG CONTENTS (FROM ERROR LOG) WAS WHAT WAS WRITTEN.
                                ;*THIS LATTER CHECK IS DONE PRIMARILY TO ENSURE THAT THE
                                ;*TRAP WAS BECAUSE WRONG PARITY WAS WRITTEN AND NOT DUE
                                ;*TO A FAILING LOCATION.
                                ;*   SECOND, THE LOCATION IS WRITTEN WITH GOOD PARITY FOR
                                ;*ALL TAG COMBINATIONS.  THE LOC IS REFERENCED AND ANY
                                ;*PARITY ERROR IS DETECTED AND REPORTED.
                                ;*   IF INHIBIT TESTS USING KT SWITCH (SW12) IS SET,
                                ;*THIS TEST IS INHIBITED.

                                ;;*****************************************************************
007140  012737  000214  177746  TST13:  MOV     #214,@#CCR      ;TURN CACHE OFF FOR SCOPE
007146  000004                          SCOPE
007150  012737  010230  001234          MOV     #TST14,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
007156  032777  010000  171750          BIT     #SW12,@SWR      ;INHIBIT TEST USING KT11?
007164  001402                          BEQ     1$              ;BRANCH IF NO
007166  000137  010230                  JMP     @#TST14         ;GO TO NEXT TEST
007172  052737  000200  036034  1$:     BIS     #200,@##KT11    ;TURN ON KT FOR $SIZE
```



```
007200  004737  035750                  JSR     PC,$SIZE        ;SIZE MEMORY
007204  012737  007354  000114          MOV     #T07L01,@#PVEC  ;SET UP TO HANDLE PARITY TRAPS
007212  012737  077406  172310          MOV     #77406,@#KIPDR4 ;PAGE LENGTH=4K, EXPAND UP, READ/WRITE
007220  005037  172350                  CLR     @#KIPAR4        ;INIT PAR
007224  052737  000001  177572          BIS     #1,@#MMR0       ;TURN KT ON
007232  023737  172350  036322  T07L04: CMP     @#KIPAR4,@#$LSTBK  ;TESTED ALL POSSIBLE ADDRESSES?
007240  003402                          BLE     1$              ;BRANCH IF NO TO CONTINUE
007242  000137  007650                  JMP     T07L02          ;TEST GOOD PARITY GEN.
007246  012737  000310  177746  1$:     MOV     #310,@#CCR      ;TURN HALF OF CACHE ON & WWP

007254  013737  100000  100000  T07L03: MOV     @#100000,@#100000  ;WRITE WRONG PARITY IN LOC
007262  012737  000210  177746          MOV     #210,@#CCR      ;WWP OFF
007270  005737  100000                  TST     @#100000        ;FORCE A PARITY ERROR


                                        ;RID CACHE OF BAD PARITY
007274  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
007302  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE


007306  012737  100000  001172          MOV     #100000,$TMP0   ;GET ADDRESS JUST TESTED
007314  004737  033434                  JSR     PC,VIP          ;CALC ITS PHYSICAL ADDRESS
007320  013737  172350  001172          MOV     @#KIPAR4,$TMP0  ;GET PAR FOR TAG CALC.
007326  004737  033606                  JSR     PC,TAG          ;CALC WHAT TAG CONTENTS SHOULD BE
007332  013737  001172  001164          MOV     $TMP0,$REG3     ;SAVE (TAG) SHOULD BE
007340  012737  007232  001110          MOV     #T07L04,@#$LPERR        ;SET UP RETURN FOR LOOP ON ERROR
007346  104027                          ERROR   27              ;ERROR: TEST OF TAG PARITY GENERATOR/CHECKER FAILED
                                                                ;       DID NOT GET PARITY TRAP FROM TAG FIELD
                                                                ;       WHEN WROTE WRONG PARITY
007350  000137  010214                  JMP     @#T07L05        ;GO TO END OF TEST

007354                          T07L01:

                                        ;RID CACHE OF BAD PARITY
007354  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
007362  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE


007366  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
007370  076600                          MED                     ;GET CONTENTS OF LOG REG
007372  000022                          .WORD   RLOG
007374  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
007400  076600                          MED                     ;UNLOCK ERROR LOG
007402  000222                          .WORD   WLOG
007404  012600                          MOV     (SP)+,R0        ;RESTORE R0

007406  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
007410  032737  000040  177744          BIT     #40,@#EREG      ;TRAP DUE TO PARITY ERROR IN TAG?
007416  001040                          BNE     T07L06          ;BRANCH IF YES
007420  076600                          MED                     ;GET LOG INFORMATION
007422  000102                          .WORD   LOADD
007424  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
007430  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
007432  000101                          .WORD   RSER
007434  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
```

```
1681  007436  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
1682  007442  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
1683  007446  076600                          MED                     ;GET TAG LOG INFO.
1684  007450  000107                          .WORD   RTAG
1685  007452  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
1686  007454  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
1687  007460  010037  001164                  MOV     R0,$REG3        ;SAVE TAG
1688  007464  013737  172350  001172          MOV     @#KIPAR4,$TMP0  ;GET PAR FOR TAG CALC.
1689  007472  004737  033606                  JSR     PC,TAG          ;FIND GOOD CONTENTS OF TAG
1690  007476  013737  001172  001166          MOV     $TMP0,$REG4     ;SAVE GOOD DATA
1691  007504  012737  007232  001110          MOV     #T07L04,@#$LPERR ;SET UP RETURN FOR ERROR LOOP
1692  007512  104030                          ERROR   30              ;ERROR: TEST OF TAG PARITY GEN/CHECKER FAILED
1693                                                                  ;       DID NOT GET PARITY TRAP FROM TAG FIELD
1694                                                                  ;       WHEN WROTE WRONG PARITY
1695  007514  000137  010214                  JMP     @#T07L05        ;GO TO END OF TEST
1696
1697  007520  013737  172350  001172  T07L06: MOV     @#KIPAR4,$TMP0  ;GET PAR FOR TAG CALC.
1698  007526  004737  033606                  JSR     PC,TAG          ;CALC WHAT TAG SHOULD BE
1699  007532  076600                          MED                     ;GET TAG LOG INFO.
1700  007534  000107                          .WORD   RTAG
1701  007536  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
1702  007540  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
1703  007544  020037  001172                  CMP     R0,$TMP0        ;DATA OK?
1704  007550  001432                          BEQ     T07L07          ;BRANCH IF YES
1705  007552  010037  001164                  MOV     R0,$REG3        ;SAVE TAG
1706  007556  076600                          MED                     ;GET LOG INFORMATION
1707  007560  000102                          .WORD   LOADD
1708  007562  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
1709  007566  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
1710  007570  000101                          .WORD   RSER
1711  007572  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
1712  007574  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
1713  007600  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
1714  007604  013737  001172  001166          MOV     $TMP0,@#$REG4   ;SAVE GOOD DATA
1715  007612  012737  007232  001110          MOV     #T07L04,@#$LPERR ;SET UP RETURN FOR ERROR LOOP
1716  007620  104031                          ERROR   31              ;ERROR: TEST OF TAG PARITY GEN/CHECKER FAILED
1717                                                                  ;       TAG FIELD HELD WRONG DATA ON PARITY TRAP
1718  007622  123727  001103  000003          CMPB    @#$ERFLG,#3     ;MORE THAN THREE ERRORS?
1719  007630  101402                          BLOS    T07L07          ;BRANCH IF NO
1720  007632  000137  010214                  JMP     T07L05          ;GO TO END OF TEST
1721
1722  007636  062737  000040  172350  T07L07: ADD     #40,@#KIPAR4    ;CALC NEXT TAG ADDRESS TO TEST
1723  007644  000137  007232                  JMP     T07L04          ;CONTINUE TEST
1724
1725  007650                          T07L02:
1726
1727                                          ;RID CACHE OF BAD PARITY
1728  007650  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
1729  007656  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
1730
1731
1732  007662  012737  007734  000114          MOV     #T07L08,@#PVEC  ;SET UP FOR PARITY ERRORS
1733  007670  005037  172350                  CLR     @#KIPAR4        ;INIT ADDRESSES
1734  007674  023737  172350  036322  T07L09: CMP     @#KIPAR4,@#$LSTBK ;TESTED ALL POSSIBLE ADDRESSES?
1735  007702  003144                          BGT     T07L05          ;YES GO TO END OF TEST
1736  007704  012737  000210  177746          MOV     #210,@#CCR      ;TURN HALF CACHE ON
```



```
1737  007712  013737  100000  100000          MOV     @#100000,@#100000 ;GENERATE PARITY IN CACHE
1738  007720  005737  102000                  TST     @#102000        ;CHECK PARITY IN CACHE
1739  007724  062737  000040  172350          ADD     #40,@#KIPAR4    ;CALC NEXT TAG ADDRESS TO TEST
1740  007732  000760                          BR      T07L09          ;CONTINUE TEST
1741
1742  007734                          T07L08:
1743
1744                                          ;RID CACHE OF BAD PARITY
1745  007734  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
1746  007742  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
1747
1748
1749
1750  007746  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
1751  007750  076600                          MED                     ;GET CONTENTS OF LOG REG
1752  007752  000022                          .WORD   RLOG

1753  007754  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
1754  007760  076600                          MED                     ;UNLOCK ERROR LOG
1755  007762  000222                          .WORD   WLOG
1756  007764  012600                          MOV     (SP)+,R0        ;RESTORE R0
1757
1758  007766  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
1759  007770  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
1760  007772  000101                          .WORD   RSER
1761  007774  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
1762  007776  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
1763  010002  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
1764  010006  076600                          MED                     ;GET LOG INFORMATION
1765  010010  000102                          .WORD   LOADD
1766  010012  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
1767  010016  032737  000040  177744          BIT     #40,@#EREG      ;ERROR DUE TO TAG ERROR?
1768  010024  001424                          BEQ     T07L10          ;BRANCH IF NO
1769  010026  076600                          MED                     ;GET TAG LOG INFO.
1770  010030  000107                          .WORD   RTAG
1771  010032  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
1772  010034  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
1773  010040  010037  001164                  MOV     R0,$REG3        ;SAVE TAG
1774  010044  013737  172350  001172          MOV     @#KIPAR4,$TMP0  ;GET PAR FOR TAG CALC.
1775  010052  004737  033606                  JSR     PC,TAG          ;CALC GOOD DATA
1776  010056  013737  001172  001166          MOV     $TMP0,@#$REG4   ;SAVE GOOD DATA
1777  010064  012737  007674  001110          MOV     #T07L09,@#$LPERR ;SET UP FOR ERROR LOOP
1778  010072  104034                          ERROR   34              ;ERROR: TEST OF TAG PARITY GEN/CHECKER FAILED
1779                                                                  ;       PARITY ERROR OCCURRED IN TAG FIELD
1780  010074  000447                          BR      T07L05          ;GO TO END OF TEST
1781
1782  010076  032737  000100  177744  T07L10: BIT     #100,@#EREG     ;ERROR IN LOW BYTE?
1783  010104  001414                          BEQ     T07L11          ;BRANCH IF NO
1784  010106  076600                          MED                     ;GET LOG INFORMATION
1785  010110  000106                          .WORD   CDL
1786  010112  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1787  010116  013737  102000  001166          MOV     @#102000,@#$REG4 ;SAVE GOOD DATA
1788  010124  012737  007674  001110          MOV     #T07L09,@#$LPERR ;INIT LOOP ON ERROR RETURN
1789  010132  104033                          ERROR   33              ;ERROR: TEST OF TAG PARITY GEN/CHECKER FAILED
1790                                                                  ;       PARITY ERROR IN LOW BYTE OF DATA
1791  010134  000427                          BR      T07L05          ;GO TO END OF TEST
1792
```

```
1793  010136  032737  000200  177744  T07L11: BIT     #200,@#EREG     ;ERROR IN HIGH BYTE?
1794  010144  001414                          BEQ     T07L12          ;BRANCH IF NO
1795  010146  076600                          MED                     ;GET LOG INFORMATION
1796  010150  000106                          .WORD   CDH
1797  010152  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1798  010156  013737  102000  001166          MOV     @#102000,$REG4  ;SAVE GOOD DATA
1799  010164  012737  007674  001110          MOV     #T07L09,@#$LPERR  ;SET UP LOOP ON ERROR
1800  010172  104032                          ERROR   32              ;ERROR: TEST OF TAG PARITY GEN/CHECKER FAILED
1801                                                                  ;       PARITY ERROR IN HIGH BYTE OF DATA
1802  010174  000407                          BR      T07L05          ;GO TO END OF TEST
1803
1804  010176  016637  177774  001164  T07L12: MOV     -4(SP),$REG3    ;SAVE PC OF ERROR
1805  010204  012737  007674  001110          MOV     #T07L09,@#$LPERR  ;SET UP FOR ERROR LOOP
1806  010212  104001                          ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
1807
1808  010214  042737  000001  177572  T07L05: BIC     #1,@#MMR0       ;TURN KT OFF
1809  010222  012737  033142  000114          MOV     #UPERR,@#114    ;RESTORE UNEXPECTED PARITY ERROR HANDLER
1810
1811                                          ;;*************************************************************
1812                                          ;*TEST 14        TEST OF DATA PARITY GENERATOR/CHECKER
1813                                          ;*
1814                                          ;*   WRONG PARITY IS WRITTEN INTO ONE BYTE OF ONE LOCATION
1815                                          ;*IN THE CACHE DATA FIELD VIA A DATOB.  THE LOC IS REFERENCED
1816                                          ;*AND THE PARITY TRAP IS CHECKED FOR.  THE TRAP FROM THE
1817                                          ;*CORRECT BYTE IS THEN TESTED.  THIS PROCEDURE IS REPEATED
1818                                          ;*FOR THE OTHER BYTE.  AFTER THIS, WRONG PARITY IS WRITTEN
1819                                          ;*FOR ALL 8 BIT COMBINATIONS IN BOTH THE LOW AND HIGH
1820                                          ;*BYTE SIMULTANEOUSLY FOR ONE LOC.  AFTER EACH DATA PATTERN
1821                                          ;*IS WRITTEN (R0 CONTAINS DATA PATTERN) A TRAP IS FORCED
1822                                          ;*AND THE PROGRAM CHECKS THAT THE TRAP WAS FROM BOTH HIGH
1823                                          ;*& LOW BYTES.
1824                                          ;*   FOLLOWING THIS ALL 8 BIT DATA PATTERNS FOR BOTH THE
1825                                          ;*HIGH & LOW BYTE ARE WRITTEN WITH GOOD PARITY IN ONE
1826                                          ;*CACHE LOC.  THE LOCATION IS REFERENCED AND ANY DATA
1827                                          ;*PARITY ERROR IS REPORTED.
1828
1829                                          ;;*************************************************************
1830  010230  012737  000214  177746  T8T14:  MOV     #214,@#CCR      ;TURN CACHE OFF FOR SCOPE
1831  010236  000004                          SCOPE
1832  010240  012737  012000  001234          MOV     #T8T15,SKT8T    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
1833  010246  012737  010350  000114          MOV     #T08L01,@#PVEC  ;SET UP PARITY TRAP HANDLER
1834  010254  012700  062000                  MOV     #BUFH,R0        ;GET TEST ADDRESS
1835  010260  005001                          CLR     R1              ;INIT FLAG TO INDIC. TESTING LOW BYTE
1836  010262  005037  001166  T08L06: CLR     @#$REG4         ;SAVE DATA IF ERROR
1837  010266  005037  001160          CLR     @#$REG1         ;SAVE ADDRESS IF ERROR
1838  010272  010037  001162          MOV     R0,@#$REG2      ;SAVE ADDRESS IF ERROR
1839  010276  012737  000204  177746          MOV     #204,@#CCR      ;TURN ON HALF OF CACHE
1840  010304  005737  062000                  TST     @#BUFH          ;PUT LOC IN CACHE
1841  010310  052737  000100  177746          BIS     #100,@#CCR      ;ENABLE WRITE WRONG PARITY
1842  010316  112710  000000                  MOVB    #0,(R0)         ;DO DATOB TO LOC & WWP
1843  010322  042737  000100  177746          BIC     #100,@#CCR      ;WWP OFF
1844  010330  005737  062000                  TST     @#BUFH          ;FORCE PARITY TRAP
1845  010334  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
1846
1847  010342  104035                          ERROR   35              ;ERROR: TEST OF DATA PARITY GENERATOR/CKER FAILED
1848                                                                  ;       DID NOT GET PARITY TRAP WHEN WROTE WRONG PARITY
```



```
1849  010344  000137  011052                  JMP     T08L02          ;GO TO NEXT TEST
1850
1851  010350  012737  000214  177746  T08L01: MOV     #214,@#CCR      ;CACHE OFF
1852
1853  010356  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
1854  010360  076600                          MED                     ;GET CONTENTS OF LOG REG
1855  010362  000022                          .WORD   RLOG
1856  010364  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
1857  010370  076600                          MED                     ;UNLOCK ERROR LOG
1858  010372  000222                          .WORD   WLOG
1859  010374  012600                          MOV     (SP)+,R0        ;RESTORE R0
1860
1861  010376  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
1862  010400  005701                          TST     R1              ;TESTING HIGH BYTE?
1863  010402  001013                          BNE     T08L03          ;BRANCH IF YES
1864  010404  032737  000100  177744          BIT     #100,@#EREG     ;WAS TRAP FROM LOW BYTE?
1865  010412  001022                          BNE     T08L04          ;BRANCH IF YES
1866
1867  010414  076600                          MED                     ;GET LOG INFORMATION
1868  010416  000106                          .WORD   CDL
1869  010420  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1870  010424  104036                          ERROR   36              ;ERROR: TEST OF DATA PARITY GENERATOR/CKER FAILED
1871                                                                  ;       DID NOT GET PARITY TRAP FROM LOW BYTE WHEN WWP
1872  010426  000137  011052                  JMP     T08L02          ;GO TO NEXT TEST
1873
1874  010432  032737  000200  177744  T08L03: BIT     #200,@#EREG     ;WAS TRAP FROM HIGH BYTE?
1875  010440  001012                          BNE     T08L05          ;BRANCH IF YES TO CONTINUE TEST
1876  010442  076600                          MED                     ;GET LOG INFORMATION
1877  010444  000106                          .WORD   CDH
1878  010446  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1879  010452  104037                          ERROR   37              ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
1880                                                                  ;       DID NOT GET PARITY TRAP FROM HIGH BYTE WHEN WWP
1881  010454  000137  011052                  JMP     T08L02          ;GO TO NEXT TEST
1882
1883  010460  005200                  T08L04: INC     R0              ;TEST HIGH BYTE
1884  010462  005201                          INC     R1              ;SET FLAG INDICATING HIGH BYTE TEST
1885  010464  000676                          BR      T08L06          ;GO TEST IT
1886
1887  010466  012737  010546  000114  T08L05: MOV     #T08L07,@#PVEC  ;SET UP PARITY TRAP HANDLER
1888  010474  012737  062000  001162          MOV     #BUFH,@#$REG2   ;SAVE ADDRESS IF ERROR
1889  010502  005000                          CLR     R0              ;INIT. TEST DATA REG
1890  010504  010037  001166  T08L10: MOV     R0,$REG4        ;SAVE DATA IF ERROR
1891  010510  012737  000304  177746          MOV     #304,@#CCR      ;TURN HALF OF CACHE ON & WWP
1892  010516  010037  062000                  MOV     R0,@#BUFH       ;GENERATE BAD PARITY AND WRITE IN CACHE
1893  010522  042737  000100  177746          BIC     #100,@#CCR      ;WWP OFF
1894  010530  005737  062000                  TST     @#BUFH          ;FORCE PARITY TRAP
1895
1896  010534  012737  000214  177746          MOV     #214,@#CCR      ;TURN CACHE OFF FOR ERROR
1897  010542  104035                          ERROR   35              ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
1898                                                                  ;       NO PARITY TRAP WHEN WROTE WRONG PARITY
1899  010544  000542                          BR      T08L02          ;GO TO NEXT TEST
1900
1901  010546  012737  000214  177746  T08L07: MOV     #214,@#CCP      ;TURN CACHE OFF AFTER TRAP
1902
1903  010554  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
1904  010556  076600                          MED                     ;GET CONTENTS OF LOG REG
```

```
1905  010560  000022                          .WORD   RLOG
1906  010562  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
1907  010566  076600                          MED                     ;UNLOCK ERROR LOG
1908  010570  000222                          .WORD   WLOG
1909  010572  012600                          MOV     (SP)+,R0        ;RESTORE R0
1910
1911  010574  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
1912  010576  032737  000100  177744          BIT     #100,@#EREG     ;TRAP FROM LOW BYTE?
1913  010604  001011                          BNE     T08L09          ;BRANCH IF YES
1914
1915  010606  076600                          MED                     ;GET LOG INFORMATION
1916  010610  000106                          .WORD   CDL
1917  010612  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1918  010616  012737  010504  001110          MOV     #T08L10,@#$LPERR  ;INIT FOR ERROR LOOP
1919  010624  104036                          ERROR   36              ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
1920                                                                  ;       NO PARITY TRAP FROM LOW BYTE WHEN WWP
1921  010626  000511                          BR      T08L02          ;GO TO END OF TEST
1922
1923  010630  032737  000200  177744  T08L09: BIT     #200,@#EREG     ;TRAP FROM HIGH BYTE?
1924  010636  001011                          BNE     T08L11          ;BRANCH IF YES
1925
1926  010640  076600                          MED                     ;GET LOG INFORMATION
1927  010642  000106                          .WORD   CDH
1928  010644  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1929  010650  012737  010504  001110          MOV     #T08L10,@#$LPERR  ;INIT FOR ERROR LOOP
1930  010656  104037                          ERROR   37              ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
1931                                                                  ;       NO PARITY TRAP FROM HIGH BYTE WHEN WWP
1932  010660  000474                          BR      T08L02          ;GO TO NEXT TEST
1933
1934  010662  022700  177777          T08L11: CMP     #177777,R0      ;ALL WRITE WRONG PARITY PATTERNS CKED?
1935  010666  001403                          BEQ     T08L12          ;BRANCH IF YES
1936  010670  062700  000401                  ADD     #401,R0         ;GENERATE DATA FOR HIGH AND LOW BYTE
1937  010674  000703                          BR      T08L10          ;GO TEST IT
1938
1939  010676  012737  010740  000114  T08L12: MOV     #T08L13,@#PVEC  ;SET UP FOR PARITY ERRORS
1940  010704  005000                          CLR     R0              ;INIT TEST DATA REG
1941  010706  012737  000204  177746  T08L14: MOV     #204,@#CCR      ;TURN HALF OF CACHE ON
1942  010714  010037  062000                  MOV     R0,@#BUFH       ;GEN PARITY AND STORE IN CACHE
1943  010720  005737  062000                  TST     @#BUFH          ;TEST PARITY
1944  010724  022700  177777          T08L16: CMP     #177777,R0      ;ALL GOOD PARITY PATTERNS CKED?
1945  010730  001450                          BEQ     T08L02          ;BRANCH YES TO END OF TEST
1946  010732  062700  000401                  ADD     #401,R0         ;GENERATE DATA FOR HIGH & LOW BYTE
1947  010736  000763                          BR      T08L14          ;TEST IT
1948
1949  010740  052737  000014  177746  T08L13: BIS     #14,@#CCR       ;TURN CACHE OFF
1950
1951  010746  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
1952  010750  076600                          MED                     ;GET CONTENTS OF LOG REG
1953  010752  000022                          .WORD   RLOG
1954  010754  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
1955  010760  076600                          MED                     ;UNLOCK ERROR LOG
1956  010762  000222                          .WORD   WLOG
1957  010764  012600                          MOV     (SP)+,R0        ;RESTORE R0
1958
1959  010766  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
1960  010770  010037  001166                  MOV     R0,$REG4        ;SAVE GOOD DATA
```



```
1961  010774  076600                          MED                     ;GET LOG INFORMATION
1962  010776  000106                          .WORD   RDAT
1963  011000  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
1964  011004  013700  001166                  MOV     $REG4,R0        ;RESTORE R0
1965  011010  032737  000100  177744          BIT     #100,@#EREG     ;PARITY ERROR LOW BYTE?
1966  011016  001405                          BEQ     T08L15          ;BRANCH IF NO
1967  011020  012737  010706  001110          MOV     #T08L14,@#$LPERR  ;INIT ERROR LOOP
1968  011026  104040                          ERROR   40              ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
1969                                                                  ;       PARITY ERROR IN LOW BYTE
1970  011030  000410                          BR      T08L02          ;GO TO END OF TEST
1971
1972  011032  032737  000200  177744  T08L15: BIT     #200,@#EREG     ;PARITY ERROR HIGH BYTE?
1973  011040  001731                          BEQ     T08L16          ;TEST NEXT PATTERN IF NO
1974  011042  012737  010706  001110          MOV     #T08L14,@#$LPERR  ;INIT RETURN FOR LOOP ON ERROR
1975  011050  104041                          ERROR   41              ;ERROR: TEST OF DATA PARITY GEN//CKER FAILED
1976                                                                  ;       PARITY ERROR IN HIGH BYTE
1977
1978  011052                          T08L02:
1979
1980                                          ;RID CACHE OF BAD PARITY
1981  011052  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
1982  011060  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
1983
1984
1985  011064  012737  033142  000114          MOV     #UPERR,@#114    ;RESTORE UNEXPECTED PARITY ERROR HANDLER
1986  011072  000137  012000                  JMP     @#TST15         ;GO TO NEXT TEST
1987
1988
1989          012000                  .=12000                         ;ADJUST ADDRESS SPACE FOR NEXT TEST
1990
1991
1992
1993                                  ;;*****************************************************************
1994                                  ;*TEST 15       TEST THE VALID BIT FOR LOW HALF OF CACHE
1995                                  ;*
1996                                  ;*   THE TEST OF THE VALID BIT IS NOT COMPLETE UNTIL THE
1997                                  ;*VALID TEST FOR THE SECOND HALF OF CACHE IS RUN.  THIS
1998                                  ;*IS THE FIRST TEST WHERE THIS ENTIRE HALF OF CACHE ADDRESSES ARE
1999                                  ;*EXERCISED.
2000                                  ;*   DURING THE ENTIRE TEST ONLY ONE TAG AND DATA VALUE IS
2001                                  ;*USED.  INITIALLY, THE ENTIRE HALF OF CACHE WHICH IS
2002                                  ;*ENABLED (FORCE MISS OFF) IS WRITTEN AND CHECKED THAT ALL
2003                                  ;*ITS ADDRESSES CAN BE MADE HITS.  FOLLOWING THIS, A WRITE/
2004                                  ;*READ PROCEDURE IS DONE WHICH VERIFIES THAT THE LOCATIONS
2005                                  ;*CAN BE VALIDATED/INVALIDATED AND THAT THERE IS NO DUAL
2006                                  ;*ADDRESSING PROBLEM FOR THE V BIT.  FIRST THE VALID BIT
2007                                  ;*IS SET FOR HALF OF CACHE, THEN STARTING AT THE LOWEST
2008                                  ;*HALF CACHE ADDRESS, EACH LOC IS TESTED TO BE A HIT (VALID
2009                                  ;*SET) AND THEN INVALIDATED VIA WRITING WRONG PARITY AND
2010                                  ;*FORCING A TRAP.  THIS IS DONE INCREASING THE ADDRESS
2011                                  ;*UNTIL HALF OF CACHE IS READ AND WRITTEN.  NEXT, STARTING
2012                                  ;*AT THE HIGH HALF CACHE ADDRESS, EACH LOC IS READ, TESTED
2013                                  ;*TO BE A MISS (VALID=0) AND THEN WRITTEN TO SET THE VALID
2014                                  ;*BIT.  THIS IS DONE, DECREASING THE ADDRESS EACH TIME,
2015                                  ;*TILL THE LOW ADDRESS IS REACHED.  THIS PROCEDURE IS THEN
2016                                  ;*REPEATED FOR A SECOND PASS WITH THE PATTERN REVERSED.
```

```
                                        ;*(I.E. STARTING WITH ALL LOC INVALIDATED AND THEN READING
                                        ;*AND WRITING THE V BIT.)
                                        ;*
                                        ;*R0 CONTAINS THE CACHE ADDRESS BEING TESTED.
                                        ;
                                        ;*NOTE:TEST FOR DUAL ADDRESSING FOR LOCATIONS WHICH OVERLAP
                                        ;*      THE PARITY TRAP ADDRESSES 114,116 IS NOT DONE
                                        ;
                                        ;;*************************************************************
012000  012737  000214  177746 TST15:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
012006  000004                         SCOPE
012010  012737  012734  001234         MOV     #TST16,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
012016  012706  020000                 MOV     #20000,SP       ;ADJUST STACK FOR ADDRESSES OUT OF TEST AREA
012022  012737  000210  177746         MOV     #210,@#CCR      ;HALF CACHE ON
012030  012700  060000                 MOV     #BUFL,R0        ;INIT STARTING ADDRESS
012034  012701  001000                 MOV     #1000,R1        ;INIT COUNT FOR 1/2 K
012040  005020         1$:     CLR     (R0)+           ;WRITE CACHE
012042  077102                 SOB     R1,1$           ;LOOP TILL HALF CACHE WRITTEN
012044  005740         T24L20: TST     -(R0)           ;SEE IF DATA IN CACHE
012046  033727  177752  000004         BIT     @#HMR,#HMR2     ;HIT? (VALID BIT SET?)
012054  001002                 BNE     T24L19          ;BRANCH IF YES
012056  000137  012624                 JMP     T24L01          ;REPORT ERROR
012062  020027  060000         T24L19: CMP     R0,#BUFL        ;HALF CACHE TESTED?
012066  001366                 BNE     T24L20          ;BRANCH IF NO

012070  012737  012154  000114         MOV     #T24L02,@#PVEC  ;SET UP PARITY HANDLER

012076  020027  060114         T24L05: CMP     R0,#BUFL!114    ;TESTING PARITY AREA?
012102  001412                 BEQ     T24L22          ;DON'T TEST ADDRESS IF YES
012104  020027  060116                 CMP     R0,#BUFL!116    ;TESTING PARITY AREA?
012110  001407                 BEQ     T24L22          ;DON'T TEST ADDRESS IF YES
012112  005710                 TST     (R0)            ;SEE IF VALID BIT SET
012114  033727  177752  000004         BIT     @#HMR,#HMR2     ;HIT? (VALID BIT SET?)
012122  001002                 BNE     T24L22          ;BRANCH IF YES
012124  000137  012646                 JMP     T24L03          ;REPORT ERROR

012130  012737  000310  177746 T24L22: MOV     #310,@#CCR      ;CACHE ON IF OFF AND WRITE WRONG PARITY
012136  005010                 CLR     (R0)            ;WRITE LOC WITH WRONG PARITY
012140  012737  000210  177746         MOV     #210,@#CCR      ;WWP OFF
012146  005710                 TST     (R0)            ;FORCE PARITY TRAP
012150  000137  012670                 JMP     T24L04          ;REPORT ERROR IF DID NOT TRAP

012154                          T24L02:

012154  010046                 MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
012156  076600                 MED                     ;GET CONTENTS OF LOG REG
012160  000022                 .WORD   RLOG
012162  052700  100001                 BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
012166  076600                 MED                     ;UNLOCK ERROR LOG
012170  000222                 .WORD   WLOG
012172  012600                 MOV     (SP)+,R0        ;RESTORE R0

012174  062700  000002                 ADD     #2,R0           ;LOOK AT NEXT ADDR.
012200  062706  000004                 ADD     #4,SP           ;RESTORE STACK
012204  020027  062000                 CMP     R0,#BUFL+2000   ;HALF ADDRESSES TESTED?
```



```
012210  001332                 BNE     T24L05          ;BRANCH IF NO

012212  012737  033142  000114         MOV     #UPERR,@#PVEC   ;RESTORE UNEXP. PARITY ERROR HANDLER
012220  005740         1$:     TST     -(R0)           ;WAS LOC INVALIDATED?
012222  033727  177752  000004         BIT     @#HMR,#HMR2     ;LOC A MISS? (INVALIDATED?)
012230  001402                 BEQ     2$              ;BRANCH IF YES
012232  000137  012712                 JMP     T24L06          ;REPORT ERROR
012236  005010         2$:     CLR     (R0)            ;WRITE LOC
012240  020027  060000                 CMP     R0,#BUFL        ;AT LAST LOC?
012244  001365                 BNE     1$              ;BRANCH IF NO

                                        ;NOW WRITE/READ VALID BIT WITH PATTERN REVERSED

012246  012737  012316  000114 T24L10: MOV     #T24L07,@#PVEC  ;SET UP FOR PARITY TRAP
012254  012700  061776                 MOV     #BUFL+1776,R0   ;INIT TEST ADDR.
012260  012737  000310  177746 T24L08: MOV     #310,@#CCR      ;WRITE WRONG PARITY & CACHE ON
012266  005010                 CLR     (R0)            ;WRITE WRONG PARITY
012270  012737  000210  177746         MOV     #210,@#CCR      ;WWP OFF
012276  005710                 TST     (R0)            ;FORCE TRAP
012300  012737  000214  177746         MOV     #214,@#CCR      ;CACHE OFF
012306  012737  012260  001110         MOV     #T24L08,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
012314  000570                 BR      T24L15          ;REPORT ERROR IF DID NOT TRAP

012316                          T24L07:

012316  010046                 MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
012320  076600                 MED                     ;GET CONTENTS OF LOG REG
012322  000022                 .WORD   RLOG
012324  052700  100001                 BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
012330  076600                 MED                     ;UNLOCK ERROR LOG
012332  000222                 .WORD   WLOG
012334  012600                 MOV     (SP)+,R0        ;RESTORE R0

012336  162700  000002                 SUB     #2,R0           ;LOOK AT NEXT ADDRESS
012342  062706  000004                 ADD     #4,SP           ;ADJUST STACK
012346  020027  057776                 CMP     R0,#BUFL-2      ;HALF CACHE WRITTEN?
012352  001342                 BNE     T24L08          ;BRANCH IF NO

012354  012737  033142  000114         MOV     #UPERR,@#PVEC
012362  062700  000002         T24L12: ADD     #2,R0           ;ADJUST ADDRESS
012366  005710                 TST     (R0)            ;READ LOC
012370  033727  177752  000004         BIT     @#HMR,#HMR2     ;MISS? (LOC INVALIDATED?)
012376  001407                 BEQ     T24L09          ;BRANCH IF YES
012400  012737  000214  177746         MOV     #214,@#CCR      ;CACHE OFF
012406  012737  012246  001110         MOV     #T24L10,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
012414  000536                 BR      T24L06          ;REPORT ERROR

012416  005010         T24L09: CLR     (R0)            ;WRITE LOC
012420  020027  061776                 CMP     R0,#BUFL+1776   ;HALF CACHE WRITTEN?
012424  001356                 BNE     T24L12          ;BRANCH IF NO

                                        ;NOW READ LOC TO SEE IF VALID STILL SET

012426  012737  012536  000114         MOV     #T24L16,@#PVEC  ;SET UP PARITY HANDLER
012434  020027  060114 T24L17: CMP     R0,#BUFL!114    ;TESTING PARITY AREA?
012440  001417                 BEQ     T24L13          ;DON'T TEST ADDRESS IF YES
```

```
2129  012442  020027  060116                    CMP     R0,#BUFL1116    ;TESTING PARITY AREA?
2130  012446  001414                            BEQ     T24L13          ;DON'T TEST ADDRESS IF YES
2131
2132  012450  005710                            TST     (R0)            ;LOC IN CACHE?
2133  012452  033727  177752  000004            BIT     @#HMR,#HMR2     ;HIT?
2134  012460  001007                            BNE     T24L13          ;BRANCH IF YES
2135  012462  012737  000214  177746            MOV     #214,@#CCR      ;CACHE OFF
2136  012470  012737  012246  001110            MOV     #T24L10,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
2137  012476  000466                            BR      T24L14          ;REPORT ERROR
2138
2139  012500  052737  000100  177746  T24L13:  BIS     #100,@#CCR      ;SET WRITE WRONG PARITY
2140  012506  005010                            CLR     (R0)            ;WRITE WRONG PARITY
2141  012510  012737  000210  177746            MOV     #210,@#CCR      ;WWP OFF
2142  012516  005710                            TST     (R0)            ;FORCE TRAP
2143  012520  012737  000214  177746            MOV     #214,@#CCR      ;CACHE OFF
2144  012526  012737  012246  001110            MOV     #T24L10,@#$LPERR
2145  012534  000460                            BR      T24L15          ;REPORT ERROR
2146
2147  012536  062706  000004            T24L16: ADD     #4,SP           ;RESTORE STACK
2148  012542  162700  000002                    SUB     #2,R0           ;LOOK AT NEXT ADDR.
2149
2150  012546  010046                            MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
2151  012550  076600                            MED                     ;GET CONTENTS OF LOG REG
2152  012552  000022                            .WORD   RLOG
2153  012554  052700  100001                    BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
2154  012560  076600                            MED                     ;UNLOCK ERROR LOG
2155  012562  000222                            .WORD   WLOG
2156  012564  012600                            MOV     (SP)+,R0        ;RESTORE R0
2157
2158  012566  020027  057776                    CMP     R0,#BUFL-2      ;ALL ADDR TESTED?
2159  012572  001320                            BNE     T24L17          ;BRANCH IF NO
2160
2161  012574                            T24L18:
2162
2163                                            ;RID CACHE OF BAD PARITY
2164  012574  012737  000214  177746            MOV     #214,@#CCR      ;CACHE OFF IF ON
2165  012602  004737  035134                    JSR     PC,SWEEP        ;GO PURGE CACHE
2166
2167
2168  012606  012737  033142  000114            MOV     #UPERR,@#PVEC
2169  012614  012706  001100                    MOV     #STACK,SP       ;RESTORE STACK
2170  012620  000137  012734                    JMP     @#TST16         ;GO TO NEXT TEST
2171
2172  012624  012737  000214  177746  T24L01:  MOV     #214,@#CCR      ;CACHE OFF
2173  012632  005037  001160                    CLR     $REG1           ;SAVE FAILING ADDR
2174  012636  010037  001162                    MOV     R0,$REG2        ;SAVE FAILING ADDR
2175  012642  104043                            ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
2176  012644  000753                            BR      T24L18          ;GO TO END OF TEST
2177
2178  012646  012737  000214  177746  T24L03:  MOV     #214,@#CCR      ;CACHE OFF
2179  012654  005037  001160            T24L14: CLR     $REG1           ;SAVE FAILING ADDRESS
2180  012660  010037  001162                    MOV     R0,$REG2        ;SAVE FAILING ADDRESS
2181  012664  104111                            ERROR   111             ;ERROR: TEST OF VALID BIT FAILED
2182                                                                    ;       LOC COULD NOT BE MADE A HIT
2183  012666  000742                            BR      T24L18          ;GO TO END OF TEST
2184
```



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2185  012670  012737  000214  177746  T24L04:  MOV     #214,@#CCR      ;CACHE OFF
2186  012676  005037  001160            T24L15: CLR     $REG1           ;SAVE FAILING ADDRESS
2187  012702  010037  001162                    MOV     R0,$REG2        ;SAVE FAILING ADDRESS
2188  012706  104042                            ERROR   42              ;ERROR: NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PARIT
2189  012710  000731                            BR      T24L18          ;GO TO END OF TEST
2190
2191  012712  012737  000214  177746  T24L06:  MOV     #214,@#CCR      ;CACHE OFF
2192  012720  005037  001160                    CLR     $REG1           ;SAVE FAILING ADDR
2193  012724  010037  001162                    MOV     R0,$REG2        ;SAVE FAILING ADDR
2194  012730  104112                            ERROR   112             ;ERROR: TEST OF VALID BIT FAILED
2195                                                                    ;       LOCATION NOT INVALIDATED BY PARITY TRAP
2196  012732  000720                            BR      T24L18          ;GO TO END OF TEST
2197
2198                                    ;;*****************************************************************
2199                                    ;*TEST 16        TEST TAG PARITY BIT FOR LOW CACHE ADDRESSES
2200                                    ;*
2201                                    ;*
2202                                    ;*    THE TEST OF THE TAG PARITY BIT IS NOT COMPLETE UNTIL
2203                                    ;*THE TAG P BIT TEST FOR THE SECOND HALF OF CACHE AND THE
2204                                    ;*MSB ADDRESS (A10) TO CACHE TAG FIELD TEST ARE RUN.  TWO
2205                                    ;*TAG ADDRESSES ARE USED TO GENERATE A PARITY BIT OF 1 AND
2206                                    ;*0.  THE FIRST ADDRESS IS CHOSEN FROM A TEST BUFFER AREA
2207                                    ;*AND THE SECOND IS CHOSEN TO LIE 1K AWAY.  A WRITE/READ
2208                                    ;*PROCEDURE IS DONE WHICH CHECKS THE P BIT AND DUAL ADD-
2209                                    ;*RESSING FOR HALF OF CACHE.  INITIALLY THE P BIT IS WRITTEN
2210                                    ;*WITH ONE PARITY PATTERN IN HALF OF CACHE.  THEN STARTING
2211                                    ;*AT THE LOW HALF CACHE ADDRESS, THE LOC IS READ AND THEN
2212                                    ;*WRITTEN WITH THE OPPOSITE PARITY.  THIS IS SEQUENTIALLY
2213                                    ;*REPEATED WITH INCREASING ADDRESSES UNTIL THE HIGH HALF
2214                                    ;*CACHE ADDRESS IS REACHED.  THEN STARTING AT THE HIGH ADDR,
2215                                    ;*THE SECOND PARITY PATTERN IS READ AND THE LOC IS REWRITTEN
2216                                    ;*WITH THE FIRST.  THIS IS SEQUENTIALLY REPEATED, DECREASING
2217                                    ;*THE ADDRESS, UNTIL THE LOW HALF CACHE ADDRESS IS REACHED.
2218                                    ;*A SECOND PASS IS THEN MADE WITH THE PARITY PATTERN RE-
2219                                    ;*VERSED.  A PARITY ERROR HANDLER IS SETUP TO DETECT PARITY
2220                                    ;*ERRORS.  ALSO, LOCS WHICH SHOULD BE HITS ARE CHECKED FOR
2221                                    ;*AND REPORTED IF NO HIT OCCURRED.
2222                                    ;*
2223                                    ;*R0, R1 CONTAIN ADDRESSES TO GENERATE COMPLIMENTARY TAG
2224                                    ;*PARITY BITS.
2225
2226                                    ;;*****************************************************************
2227  012734  012737  000214  177746  TST16:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
2228  012742  000004                            SCOPE
2229  012744  012737  013406  001234            MOV     #TST17,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
2230  012752  012737  013126  000114            MOV     #T11L01,@#PVEC  ;SET UP FOR PARITY ERRORS
2231  012760  005003                            CLR     R3              ;INIT FLAG=FIRST PASS
2232  012762  012700  060000                    MOV     #BUFL,R0        ;SET UP ADDR. FOR FIRST PASS
2233  012766  012737  000210  177746            MOV     #210,@#CCR      ;TURN HALF CACHE ON
2234  012774  012701  001000            T11L02: MOV     #1000,R1        ;INIT COUNTER
2235  013000  005720                    1$:     TST     (R0)+           ;PUT PARITY PATTERN IN TAG FIELD
2236  013002  077102                            SOB     R1,1$           ;LOAD HALF OF CACHE
2237
2238  013004  012701  001000                    MOV     #1000,R1        ;INIT. COUNTER
2239  013010  012700  060000                    MOV     #BUFL,R0        ;SET UP ADDR. FOR FIRST PASS
2240  013014  012702  054000                    MOV     #BUFL-4000,R2   ;SET UP ADDR. FOR FIRST PASS
```

```
2241  013020  005703                          TST     R3              ;FIRST PASS?
2242  013022  001404                          BEQ     T11L03          ;BRANCH IF YES
2243  013024  012700  054000                  MOV     #BUFL-4000,R0   ;SET UP ADDR. FOR SECOND PASS
2244  013030  012702  060000                  MOV     #BUFL,R2        ;SET UP ADDR. FOR SECOND PASS
2245  013034  005720                  T11L03: TST     (R0)+           ;READ CACHE TO SEE IF PARITY OK; NO-TRAPS
2246  013036  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS ADDRESS A HIT?
2247  013044  001533                          BEQ     T11L04          ;BRANCH TO ERROR IF NO
2248  013046  005722                          TST     (R2)+           ;WRITE DIFFERENT PARITY PATTERN IN TAG FIELD
2249  013050  077107                          SOB     R1,T11L03       ;LOOK AT HALF OF CACHE
2250
2251  013052  012701  001000                  MOV     #1000,R1        ;INIT COUNTER
2252  013056  005742                  T11L11: TST     -(R2)           ;READ SECOND PARITY PATTERN
2253  013060  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS ADDRESS A HIT?
2254  013066  001532                          BEQ     T11L05          ;BRANCH IF NO TO ERROR
2255  013070  005740                          TST     -(R0)           ;PUT NEW PARITY PATTERN IN TAG
2256  013072  077107                          SOB     R1,T11L11       ;LOOK AT HALF OF CACHE
2257
2258  013074  005703                          TST     R3              ;FIRST PASS?
2259  013076  001140                          BNE     T11L06          ;NO GO TO END OF TEST
2260  013100  052703  000001                  BIS     #1,R3           ;SET FLAG TO INDIC. SECOND PASS
2261  013104  012737  000210  177746  T11L12: MOV     #210,@#CCR      ;HALF CACHE ON IF OFF
2262  013112  012737  013104  001110          MOV     #T11L12,@#$LPERR  ;SETUP RETURN FOR ERROR IF ONE OCCURS
2263  013120  012700  054000                  MOV     #BUFL-4000,R0   ;SET UP FOR SECOND PASS.
2264  013124  000723                          BR      T11L02          ;GO TEST SECOND PASS
2265
2266  013126                           T11L01:
2267
2268                                          ;RID CACHE OF BAD PARITY
2269  013126  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
2270  013134  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
2271
2272
2273
2274  013140  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
2275  013142  076600                          MED                     ;GET CONTENTS OF LOG REG
2276  013144  000022                          .WORD   RLOG
2277  013146  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
2278  013152  076600                          MED                     ;UNLOCK ERROR LOG
2279  013154  000222                          .WORD   WLOG
2280  013156  012600                          MOV     (SP)+,R0        ;RESTORE R0
2281
2282  013160  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
2283  013162  000101                          .WORD   RSER
2284  013164  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
2285  013166  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
2286  013172  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
2287  013176  076600                          MED                     ;GET LOG INFORMATION
2288  013200  000102                          .WORD   LOADD
2289  013202  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
2290  013206  076600                          MED                     ;GET LOG INFORMATION
2291  013210  000100                          .WORD   RJAM
2292  013212  032700  000400                  BIT     #400,R0         ;ERROR IN BACKING STORE?
2293  013216  001410                          BEQ     T11L07          ;BRANCH IF NO
2294  013220  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 WHERE ERROR OCCURRED
2295  013224  162737  000002  001166          SUB     #2,$REG4        ;SAVE PC WHERE ERROR OCCURRED
2296  013232  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
```



```
2297  013234  104001                          ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
2298  013236  000460                          BR      T11L06          ;GO TO NEXT TEST
2299
2300  013240  022626                   T11L07: CMP     (SP)+,(SP)+     ;RESTORE STACK
2301  013242  032737  000040  177744          BIT     #40,@#EREG      ;ERROR IN TAG?
2302  013250  001411                          BEQ     T11L08          ;BRANCH NO
2303  013252  076600                          MED                     ;GET TAG LOG INFO.
2304  013254  000107                          .WORD   RTAG
2305  013256  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
2306  013260  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
2307  013264  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
2308  013270  104045                          ERROR   45              ;ERROR: TAG PARITY ERROR WHEN TESTING TAG P BIT
2309  013272  000442                          BR      T11L06          ;GO TO NEXT TEST
2310
2311  013274  032737  000100  177744  T11L08: BIT     #100,@#EREG     ;ERROR IN LOW BYTE?
2312  013302  001406                          BEQ     T11L09          ;BRANCH IF NO

2313  013304  076600                          MED                     ;GET LOG INFORMATION
2314  013306  000106                          .WORD   CDL
2315  013310  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
2316  013314  104046                          ERROR   46              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING TAG P BIT
2317  013316  000430                          BR      T11L06          ;NEXT TEST
2318
2319  013320                           T11L09:
2320  013320  076600                          MED                     ;GET LOG INFORMATION
2321  013322  000106                          .WORD   CDH
2322  013324  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
2323  013330  104047                          ERROR   47              ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING TAG P BIT
2324  013332  000422                          BR      T11L06          ;NEXT TEST
2325
2326  013334  052737  000014  177746  T11L04: BIS     #14,@#CCR       ;CACHE OFF
2327  013342  162700  000002                  SUB     #2,R0           ;GET BAD ADDRESS
2328  013346  010037  001162                  MOV     R0,$REG2        ;SAVE BAD ADDRESS
2329  013352  000407                          BR      T11L10          ;REPORT ERROR
2330  013354  052737  000014  177746  T11L05: BIS     #14,@#CCR       ;CACHE OFF
2331  013362  010237  001162                  MOV     R2,$REG2        ;SAVE BAD ADDRESS
2332  013366  062702  000002                  ADD     #2,R2           ;RESTORE R2 TO FAILING ADDR.+2
2333  013372  005037  001160          T11L10: CLR     $REG1           ;SAVE BAD ADDRESS
2334  013376  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
2335
2336  013400  012737  033142  000114  T11L06: MOV     #UPERR,@#PVEC   ;RESTORE PARITY TRAP HANDLER
2337
2338                                          ;;*****************************************************************
2339                                          ;*TEST 17       TEST DATA PARITY BITS FOR LOW CACHE
2340                                          ;*
2341                                          ;*   THE TEST OF THE DATA PARITY BITS ARE NOT COMPLETE
2342                                          ;*UNTIL THE DATA P BIT TEST FOR THE SECOND HALF OF CACHE
2343                                          ;*AND THE MSB ADDRESS (A10) TO CACHE DATA FIELD ARE RUN.
2344                                          ;*A WRITE/READ PROCEDURE IS DONE WHICH SIMULTANEOUSLY
2345                                          ;*CHECKS THE DATA P BIT FOR BOTH BYTES AND DUAL ADDRESSING
2346                                          ;*IN HALF OF CACHE FOR IT.  INITIALLY THE P BIT IS WRITTEN
2347                                          ;*WITH ONE PARITY PATTERN IN HALF OF CACHE.  THEN STARTING
2348                                          ;*AT THE LOW HALF CACHE ADDRESS, THE LOC IS READ AND THEN
2349                                          ;*WRITTEN WITH THE OPPOSITE PARITY.  THIS IS  SEQUEN-
2350                                          ;*TIALLY REPEATED WITH INCREASING ADDRESSES UNTIL THE HIGH
2351                                          ;*HALF CACHE ADDRESS IS REACHED.  THEN STARTING AT THE
2352                                          ;*HIGH ADDR, THE SECOND PARITY PATTERN IS READ AND THE LOC
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                                        ;*IS REWRITTEN WITH THE FIRST.  THIS IS SEQUENTIALLY RE-
                                        ;*PEATED DECREASING THE ADDRESS UNTIL THE LOW HALF CACHE
                                        ;*ADDRESS IS REACHED.  A SECOND PASS IS THEN MADE WITH
                                        ;*THE PARITY PATTERN REVERSED.  A PARITY ERROR HANDLER IS
                                        ;*SETUP TO DETECT PARITY ERRORS.  ALSO, LOCS WHICH SHOULD
                                        ;*BE HITS ARE CHECKED FOR AND REPORTED IF NO HIT OCCURRED.
                                        ;*
                                        ;*R0, R1 CONTAIN DATA WHICH GENERATE OPPOSITE PARITY.  R3
                                        ;*INDICATES WHICH PASS IS BEING DONE.

                                        ;;*****************************************************************
013406  012737  000214  177746  TST17:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
013414  000004                          SCOPE
013416  012737  014100  001234          MOV     #TST20,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
013424  012737  013646  000114          MOV     #T12L01,@#PVEC  ;SET UP PARITY ERROR HANDLER
013432  005003                          CLR     R3              ;INIT FLAG FOR FIRST PASS
013434  005000                          CLR     R0              ;SET UP PARITY PATTERN A FOR FIRST PASS
013436  012737  000210  177746  T12L02: MOV     #210,@#CCR      ;HALF CACHE ON
013444  012701  001000                  MOV     #1000,R1        ;INIT ADDR. COUNTER
013450  012705  060000                  MOV     #BUFL,R5        ;INIT. TEST ADDRESS
013454  010025                  1$:     MOV     R0,(R5)+        ;WRITE DATA PARITY PATTERN
013456  077102                          SOB     R1,1$           ;HALF ADDR. WRITTEN? BRANCH IF NO

013460  012701  001000                  MOV     #1000,R1        ;INIT ADDR. COUNTER
013464  012705  060000                  MOV     #BUFL,R5        ;INIT. TEST ADDR
013470  012704  000401                  MOV     #401,R0         ;SET UP PATTERN B FOR FIRST PASS
013474  005703                          TST     R3              ;FIRST PASS?
013476  001401                          BEQ     2$              ;BRANCH IF YES
013500  005000                          CLR     R0              ;SET UP PARITY PATTERN A FOR SECOND PASS
013502  005715                  2$:     TST     (R5)            ;SEE IF PARITY UNCHANGED
013504  033727  177752  000004          BIT     @#HMR,#HMR2     ;DATA FROM CACHE?
013512  001444                          BEQ     T12L07          ;BRANCH TO ERROR IF NO
013514  010025                          MOV     R0,(R5)+        ;WRITE NEW DATA PARITY PATTERN
013516  077107                          SOB     R1,2$           ;HALF ADDR. SPACE EXAMINED & WRITTEN?

013520  012701  001000                  MOV     #1000,R1        ;INIT ADDR. COUNTER
013524  005000                          CLR     R0              ;SET UP PARITY PATTERN A FOR FIRST PASS
013526  005703                          TST     R3              ;FIRST PASS?
013530  001402                          BEQ     T12L06          ;BRANCH IF YES
013532  012700  000401                  MOV     #401,R0         ;SET UP PARITY PATTERN B FOR SECOND PASS
013536  012737  000210  177746  T12L06: MOV     #210,@#CCR      ;HALF CACHE ON IF OFF FROM ERROR
013544  005745                  1$:     TST     -(R5)           ;SEE IF PARITY UNCHANGED
013546  033727  177752  000004          BIT     @#HMR,#HMR2     ;DATA FROM CACHE
013554  001423                          BEQ     T12L07          ;BRANCH IF NO TO ERROR
013556  010015                          MOV     R0,(R5)         ;WRITE NEW PARITY PATTERN IN CACHE
013560  077107                          SOB     R1,1$           ;HALF OF ADDRESS SPACE READ & WRITTEN? BRANCH IF NO

013562  005703                          TST     R3              ;SECOND PASS?
013564  001010                          BNE     T12L08          ;GO TO END OF TEST IF YES
013566  012700  000401          T12L13: MOV     #401,R0         ;SET UP PARITY PATTERN B FOR SECOND PASS
013572  052703  000001                  BIS     #1,R3           ;SET FLAG FOR PASS 2
013576  012737  013566  001110          MOV     #T12L13,@#$LPERR ;INIT RETURN FOR ERROR LOOP IF ERROR OCCURS
013604  000714                          BR      T12L02          ;TEST DATA

013606  012737  033142  000114  T12L08: MOV     #UPERR,@#PVEC   ;RESTORE PARITY ERROR HANDLER
```



```
013614  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF WHEN CROSS CACHE ADDRESS BOUNDARY
013622  000526                          BR      TST20           ;;GO TO NEXT TEST

013624  052737  000014  177746  T12L07: BIS     #14,@#CCR       ;CACHE OFF
013632  010537  001162                  MOV     R5,$REG2        ;SAVE BAD ADDRESS
013636  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
013642  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
013644  000760                          BR      T12L08          ;GO TO END OF TEST

013646  052737  000014  177746  T12L01: BIS     #14,@#CCR       ;CACHE OFF

013654  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
013656  076600                          MED                     ;GET CONTENTS OF LOG REG
013660  000022                          .WORD   RLOG
013662  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
013666  076600                          MED                     ;UNLOCK ERROR LOG
013670  000222                          .WORD   WLOG
013672  012600                          MOV     (SP)+,R0        ;RESTORE R0

013674  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
013676  000101                          .WORD   RSER
013700  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
013702  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
013706  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
013712  076600                          MED                     ;GET LOG INFORMATION
013714  000102                          .WORD   LOADD
013716  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
013722  032737  000040  177744          BIT     #40,@#EREG      ;ERROR IN TAG?
013730  001417                          BEQ     T12L09          ;BRANCH IF NO
013732  011637  001166                  MOV     (SP),$REG4      ;GET PC+2 OF ERROR
013736  162737  000002  001166          SUB     #2,$REG4        ;GET PC OF ERROR
013744  076600                          MED                     ;GET TAG LOG INFO.
013746  000107                          .WORD   RTAG
013750  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
013752  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
013756  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
013762  022626                          CMP     (SP)+,(SP)+     ;RESTORE THE STACK
013764  104002                          ERROR   2               ;ERROR: UNEXPECTED PARITY ERROR IN TAG FIELD
013766  000707                          BR      T12L08          ;GO TO END OF TEST

013770  022626                  T12L09: CMP     (SP)+,(SP)+     ;RESTORE STACK
013772  005037  001166                  CLR     $REG4           ;SAVE GOOD DATA
013776  005700                          TST     R0              ;WAS TEST DATA =0?
014000  001003                          BNE     T12L11          ;BRANCH IF NO
014002  012737  000401  001166          MOV     #401,$REG4      ;SAVE GOOD DATA
014010  032737  000200  177744  T12L11: BIT     #200,@#EREG     ;ERROR IN HIGH BYTE?
014016  001406                          BEQ     T12L12          ;BRANCH IF NO
014020  076600                          MED                     ;GET LOG INFORMATION
014022  000106                          .WORD   CDH
014024  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
014030  104050                          ERROR   50              ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA P BITS
014032  000665                          BR      T12L09          ;GO TO END OF TEST

014034  032777  000100  163702  T12L12: BIT     #100,@EREG      ;ERROR IN LOW BYTE?
014042  001406                          BEQ     T12L14          ;BRANCH IF NO
014044  076600                          MED                     ;GET LOG INFORMATION
```

```
2465  014046  000106                          .WORD   CDL
2466  014050  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
2467  014054  104051                          ERROR   51              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA P BITS
2468  014056  000653                          BR      T12L08          ;GO TO END OF TEST
2469
2470  014060  016637  177774  001164  T12L14: MOV     -4(SP),$REG3    ;GET PC+2 OF TRAP
2471  014066  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF TRAP
2472  014074  104001                          ERROR   1               ;ERROR: UNEXP. PARITY ERROR IN BACKING STORE
2473  014076  000643                          BR      T12L08          ;GO TO END OF TEST
2474
2475
2476
2477                                  ;;*************************************************************
2478                                  ;*TEST 20        TEST THE VALID BIT FOR HIGH HALF OF CACHE
2479                                  ;*
2480                                  ;*   THE TEST OF THE VALID BIT IS NOT COMPLETE UNTIL THE
2481                                  ;*VALID TEST FOR THE SECOND HALF OF CACHE IS RUN.  THIS
2482                                  ;*IS THE FIRST TEST WHERE THIS ENTIRE HALF OF CACHE ADDRESSES ARE
2483                                  ;*EXERCISED.
2484                                  ;*   DURING THE ENTIRE TEST ONLY ONE TAG AND DATA VALUE IS
2485                                  ;*USED.  INITIALLY, THE ENTIRE HALF OF CACHE WHICH IS
2486                                  ;*ENABLED (FORCE MISS OFF) IS WRITTEN AND CHECKED THAT ALL
2487                                  ;*ITS ADDRESSES CAN BE MADE HITS.  FOLLOWING THIS, A WRITE/
2488                                  ;*READ PROCEDURE IS DONE WHICH VERIFIES THAT THE LOCATIONS
2489                                  ;*CAN BE VALIDATED/INVALIDATED AND THAT THERE IS NO DUAL
2490                                  ;*ADDRESSING PROBLEM FOR THE V BIT.  FIRST THE VALID BIT
2491                                  ;*IS SET FOR HALF OF CACHE, THEN STARTING AT THE LOWEST
2492                                  ;*HALF CACHE ADDRESS, EACH LOC IS TESTED TO BE A HIT (VALID
2493                                  ;*SET) AND THEN INVALIDATED VIA WRITING WRONG PARITY AND
2494                                  ;*FORCING A TRAP.  THIS IS DONE INCREASING THE ADDRESS
2495                                  ;*UNTIL HALF OF CACHE IS READ AND WRITTEN.  NEXT, STARTING
2496                                  ;*AT THE HIGH HALF CACHE ADDRESS, EACH LOC IS READ, TESTED
2497                                  ;*TO BE A MISS (VALID=0) AND THEN WRITTEN TO SET THE VALID
2498                                  ;*BIT.  THIS IS DONE, DECREASING THE ADDRESS EACH TIME,
2499                                  ;*TILL THE LOW ADDRESS IS REACHED.  THIS PROCEDURE IS THEN
2500                                  ;*REPEATED FOR A SECOND PASS WITH THE PATTERN REVERSED.
2501                                  ;*(I.E. STARTING WITH ALL LOC INVALIDATED AND THEN READING
2502                                  ;*AND WRITING THE V BIT.)
2503                                  ;*
2504                                  ;*R0 CONTAINS THE CACHE ADDRESS BEING TESTED.
2505
2506                                  ;;*************************************************************
2507  014100  012737  000214  177746  T5T20:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
2508  014106  000004                          SCOPE
2509  014110  012737  015000  001234          MOV     #T5T21,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
2510  014116  012737  000204  177746          MOV     #204,@#CCR      ;HALF CACHE ON
2511  014124  012700  062000                  MOV     #BUFH,R0        ;INIT STARTING ADDRESS
2512  014130  012701  001000                  MOV     #1000,R1        ;INIT COUNT FOR 1/2 K
2513  014134  005020                  1$:     CLR     (R0)+           ;WRITE CACHE
2514  014136  077102                          SOB     R1,1$           ;LOOP TILL HALF CACHE WRITTEN
2515
2516  014140  005740                  T24H20: TST     -(R0)           ;SEE IF DATA IN CACHE
2517  014142  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT? (VALID BIT SET?)
2518  014150  001002                          BNE     T24H19          ;BRANCH IF YES
2519  014152  000137  014670                  JMP     T24H01          ;REPORT ERROR
2520  014156  020027  062000          T24H19: CMP     R0,#BUFH        ;HALF CACHE TESTED?
```



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2521  014162  001366                          BNE     T24H20          ;BRANCH IF NO
2522
2523  014164  012737  014242  000114          MOV     #T24H02,@#PVEC  ;SET UP PARITY HANDLER
2524  014172  012737  000204  177746  T24H21: MOV     #204,@#CCR      ;CACHE ON IF OFF
2525  014200  005710          T24H05: TST     (R0)            ;SEE IF VALID BIT SET
2526  014202  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT? (VALID BIT SET?)
2527  014210  001002                          BNE     T24H22          ;BRANCH IF YES
2528  014212  000137  014712                  JMP     T24H03          ;REPORT ERROR
2529
2530  014216  012737  000304  177746  T24H22: MOV     #304,@#CCR      ;CACHE ON IF OFF AND WRITE WRONG PARITY
2531  014224  005010                          CLR     (R0)            ;WRITE LOC WITH WRONG PARITY
2532  014226  012737  000204  177746          MOV     #204,@#CCR      ;WWP OFF
2533  014234  005710                          TST     (R0)            ;FORCE PARITY TRAP
2534  014236  000137  014734                  JMP     T24H04          ;REPORT ERROR IF DID NOT TRAP
2535
2536  014242                          T24H02:
2537
2538  014242  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
2539  014244  076600                          MED                     ;GET CONTENTS OF LOG REG
2540  014246  000022                          .WORD   RLOG
2541  014250  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
2542  014254  076600                          MED                     ;UNLOCK ERROR LOG
2543  014256  000222                          .WORD   WLOG
2544  014260  012600                          MOV     (SP)+,R0        ;RESTORE R0
2545
2546  014262  062700  000002                  ADD     #2,R0           ;LOOK AT NEXT ADDR.
2547  014266  062706  000004                  ADD     #4,SP           ;RESTORE STACK
2548  014272  020027  064000                  CMP     R0,#BUFH+2000   ;HALF ADDRESSES TESTED?
2549  014276  001340                          BNE     T24H05          ;BRANCH IF NO
2550
2551  014300  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE UNEXP. PARITY ERROR HANDLER
2552  014306  005740                  1$:     TST     -(R0)           ;WAS LOC INVALIDATED?
2553  014310  033727  177752  000004          BIT     @#HMR,#HMR2     ;LOC A MISS? (INVALIDATED?)
2554  014316  001402                          BEQ     2$              ;BRANCH IF YES
2555  014320  000137  014756                  JMP     T24H06          ;REPORT ERROR
2556  014324  005010                  2$:     CLR     (R0)            ;WRITE LOC
2557  014326  020027  062000                  CMP     R0,#BUFH        ;AT LAST LOC?
2558  014332  001365                          BNE     1$              ;BRANCH IF NO
2559
2560                                  ;NOW WRITE/READ VALID BIT WITH PATTERN REVERSED
2561
2562  014334  012737  014404  000114  T24H10: MOV     #T24H07,@#PVEC  ;SET UP FOR PARITY TRAP
2563  014342  012700  063776                  MOV     #BUFH+1776,R0   ;INIT TEST ADDR.
2564  014346  012737  000304  177746  T24H08: MOV     #304,@#CCR      ;WRITE WRONG PARITY & CACHE ON
2565  014354  005010                          CLR     (R0)            ;WRITE WRONG PARITY & CACHE ON
2566  014356  012737  000204  177746          MOV     #204,@#CCR      ;WWP OFF
2567  014364  005710                          TST     (R0)            ;FORCE TRAP
2568  014366  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
2569  014374  012737  014346  001110          MOV     #T24H08,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
2570  014402  000557                          BP      T24H15          ;REPORT ERROR IF DID NOT TRAP
2571
2572  014404                          T24H07:
2573
2574  014404  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
2575  014406  076600                          MED                     ;GET CONTENTS OF LOG REG
2576  014410  000022                          .WORD   RLOG
```

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2577  014412  052700  100001          BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
2578  014416  076600                  MED                     ;UNLOCK ERROR LOG
2579  014420  000222                  .WORD   WLOG
2580  014422  012600                  MOV     (SP)+,R0        ;RESTORE R0
2581
2582  014424  162700  000002          SUB     #2,R0           ;LOOK AT NEXT ADDRESS
2583  014430  062706  000004          ADD     #4,SP           ;ADJUST STACK
2584  014434  020027  061776          CMP     R0,#BUFH-2      ;HALF CACHE WRITTEN?
2585  014440  001342                  BNE     T24H08          ;BRANCH IF NO
2586
2587  014442  012737  033142  000114          MOV     #UPERR,@#PVEC
2588  014450  062700  000002  T24H12: ADD     #2,R0           ;ADJUST ADDRESS
2589  014454  005710                  TST     (R0)            ;READ LOC
2590  014456  033727  177752  000004          BIT     @#HMR,#HMR2     ;MISS? (LOC INVALIDATED?)
2591  014464  001407                  BEQ     T24H09          ;BRANCH IF YES
2592  014466  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
2593  014474  012737  014334  001110          MOV     #T24H10,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
2594  014502  000525                  BR      T24H06          ;REPORT ERROR
2595
2596  014504  005010  T24H09: CLR     (R0)            ;WRITE LOC
2597  014506  020027  063776          CMP     R0,#BUFH+1776   ;HALF CACHE WRITTEN?
2598  014512  001356                  BNE     T24H12          ;BRANCH IF NO
2599
2600                                  ;NOW READ LOC TO SEE IF VALID STILL SET
2601
2602  014514  012737  014610  000114          MOV     #T24H16,@#PVEC  ;SET UP PARITY HANDLER
2603  014522  005710  T24H17: TST     (R0)            ;LOC IN CACHE?
2604  014524  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT?
2605  014532  001007                  BNE     T24H13          ;BRANCH IF YES
2606  014534  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
2607  014542  012737  014334  001110          MOV     #T24H10,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
2608  014550  000463                  BR      T24H14          ;REPORT ERROR
2609
2610  014552  052737  000100  177746  T24H13: BIS     #100,@#CCR      ;SET WRITE WRONG PARITY
2611  014560  005010                  CLR     (R0)            ;WRITE WRONG PARITY
2612  014562  012737  000204  177746          MOV     #204,@#CCR      ;WWP OFF
2613  014570  005710                  TST     (R0)            ;FORCE TRAP
2614  014572  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
2615  014600  012737  014334  001110          MOV     #T24H10,@#$LPERR
2616  014606  000455                  BR      T24H15          ;REPORT ERROR
2617
2618  014610  062706  000004  T24H16: ADD     #4,SP           ;RESTORE STACK
2619  014614  162700  000002          SUB     #2,R0           ;LOOK AT NEXT ADDR.
2620
2621  014620  010046                  MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
2622  014622  076600                  MED                     ;GET CONTENTS OF LOG REG
2623  014624  000022                  .WORD   RLOG
2624  014626  052700  100001          BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
2625  014632  076600                  MED                     ;UNLOCK ERROR LOG
2626  014634  000222                  .WORD   WLOG
2627  014636  012600                  MOV     (SP)+,R0        ;RESTORE R0
2628
2629  014640  020027  061776          CMP     R0,#BUFH-2      ;ALL ADDR TESTED?
2630  014644  001326                  BNE     T24H17          ;BRANCH IF NO
2631
2632  014646  T24H18:
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2633
2634                                  ;RID CACHE OF BAD PARITY
2635  014646  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
2636  014654  004737  035134                  JSR     PC,$WEEP        ;GO PURGE CACHE
2637
2638
2639  014660  012737  033142  000114          MOV     #UPERR,@#PVEC
2640  014666  000444                  BR      TST21           ;;GO TO NEXT TEST
2641
2642  014670  012737  000214  177746  T24H01: MOV     #214,@#CCR      ;CACHE OFF
2643  014676  005037  001160          CLR     $REG1           ;SAVE FAILING ADDR
2644  014702  010037  001162          MOV     R0,$REG2        ;SAVE FAILING ADDR
2645  014706  104043                  ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
2646  014710  000756                  BR      T24H18          ;GO TO END OF TEST
2647
2648  014712  012737  000214  177746  T24H03: MOV     #214,@#CCR      ;CACHE OFF
2649  014720  005037  001160  T24H14: CLR     $REG1           ;SAVE FAILING ADDRESS
2650  014724  010037  001162          MOV     R0,$REG2        ;SAVE FAILING ADDRESS
2651  014730  104111                  ERROR   111             ;ERROR: TEST OF VALID BIT FAILED
2652                                                          ;       LOC COULD NOT BE MADE A HIT
2653  014732  000745                  BR      T24H18          ;GO TO END OF TEST
2654
2655  014734  012737  000214  177746  T24H04: MOV     #214,@#CCR      ;CACHE OFF
2656  014742  005037  001160  T24H15: CLR     $REG1           ;SAVE FAILING ADDRESS
2657  014746  010037  001162          MOV     R0,$REG2        ;SAVE FAILING ADDRESS
2658  014752  104042                  ERROR   42              ;ERROR: NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PARIT
2659  014754  000734                  BR      T24H18          ;GO TO END OF TEST
2660
2661  014756  012737  000214  177746  T24H06: MOV     #214,@#CCR      ;CACHE OFF
2662  014764  005037  001160          CLR     $REG1           ;SAVE FAILING ADDR
2663  014770  010037  001162          MOV     R0,$REG2        ;SAVE FAILING ADDR
2664  014774  104112                  ERROR   112             ;ERROR: TEST OF VALID BIT FAILED
2665                                                          ;       LOCATION NOT INVALIDATED BY PARITY TRAP
2666  014776  000723                  BR      T24H18          ;GO TO END OF TEST
2667
2668                                  ;;*****************************************************************
2669                                  ;*TEST 21        TEST TAG PARITY BIT FOR HIGH CACHE ADDRESSES
2670                                  ;*
2671                                  ;*
2672                                  ;*   THE TEST OF THE TAG PARITY BIT IS NOT COMPLETE UNTIL
2673                                  ;*THE TAG P BIT TEST FOR THE SECOND HALF OF CACHE AND THE
2674                                  ;*MSB ADDRESS (A10) TO CACHE TAG FIELD TEST ARE RUN.  TWO
2675                                  ;*TAG ADDRESSES ARE USED TO GENERATE A PARITY BIT OF 1 AND
2676                                  ;*0.  THE FIRST ADDRESS IS CHOSEN FROM A TEST BUFFER AREA
2677                                  ;*AND THE SECOND IS CHOSEN TO LIE 1K AWAY.  A WRITE/READ
2678                                  ;*PROCEDURE IS DONE WHICH CHECKS THE P BIT AND DUAL ADD-
2679                                  ;*RESSING FOR HALF OF CACHE.  INITIALLY THE P BIT IS WRITTEN
2680                                  ;*WITH ONE PARITY PATTERN IN HALF OF CACHE.  THEN STARTING
2681                                  ;*AT THE LOW HALF CACHE ADDRESS, THE LOC IS READ AND THEN
2682                                  ;*WRITTEN WITH THE OPPOSITE PARITY.  THIS IS SEQUENTIALLY
2683                                  ;*REPEATED WITH INCREASING ADDRESSES UNTIL THE HIGH HALF
2684                                  ;*CACHE ADDRESS IS REACHED.  THEN STARTING AT THE HIGH ADDR,
2685                                  ;*THE SECOND PARITY PATTERN IS READ AND THE LOC IS REWRITTEN
2686                                  ;*WITH THE FIRST.  THIS IS SEQUENTIALLY REPEATED, DECREASING
2687                                  ;*THE ADDRESS, UNTIL THE LOW HALF CACHE ADDRESS IS REACHED.
2688                                  ;*A SECOND PASS IS THEN MADE WITH THE PARITY PATTERN RE-
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                                        ;*VERSED.  A PARITY ERROR HANDLER IS SETUP TO DETECT PARITY
                                        ;*ERRORS.  ALSO, LOCS WHICH SHOULD BE HITS ARE CHECKED FOR
                                        ;*AND REPORTED IF NO HIT OCCURRED.
                                        ;*
                                        ;*R0, R1 CONTAIN ADDRESSES TO GENERATE COMPLIMENTARY TAG
                                        ;*PARITY BITS.

                                        ;;*************************************************************
015000  012737  000214  177746  TST21:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
015006  000004                          SCOPE
015010  012737  016000  001234          MOV     #TST22,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
015016  012737  015172  000114          MOV     #T11H01,@#PVEC  ;SET UP FOR PARITY ERRORS
015024  005003                          CLR     R3              ;INIT FLAG=FIRST PASS
015026  012700  062000                  MOV     #BUFH,R0        ;SET UP ADDR. FOR FIRST PASS
015032  012737  000204  177746          MOV     #204,@#CCR      ;TURN HALF CACHE ON
015040  012701  001000          T11H02: MOV     #1000,R1        ;INIT COUNTER
015044  005720                  1$:     TST     (R0)+           ;PUT PARITY PATTERN IN TAG FIELD
015046  077102                          SOB     R1,1$           ;LOAD HALF OF CACHE

015050  012701  001000                  MOV     #1000,R1        ;INIT. COUNTER
015054  012700  062000                  MOV     #BUFH,R0        ;SET UP ADDR. FOR FIRST PASS
015060  012702  056000                  MOV     #BUFH-4000,R2   ;SET UP ADDR. FOR FIRST PASS
015064  005703                          TST     R3              ;FIRST PASS?
015066  001404                          BEQ     T11H03          ;BRANCH IF YES
015070  012700  056000                  MOV     #BUFH-4000,R0   ;SET UP ADDR. FOR SECOND PASS
015074  012702  062000                  MOV     #BUFH,R2        ;SET UP ADDR. FOR SECOND PASS
015100  005720          T11H03: TST     (R0)+           ;READ CACHE TO SEE IF PARITY OK; NO=TRAPS
015102  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS ADDRESS A HIT?
015110  001533                          BEQ     T11H04          ;BRANCH TO ERROR IF NO
015112  005722                          TST     (R2)+           ;WRITE DIFFERENT PARITY PATTERN IN TAG FIELD
015114  077107                          SOB     R1,T11H03       ;LOOK AT HALF OF CACHE

015116  012701  001000                  MOV     #1000,R1        ;INIT COUNTER
015122  005742          T11H11: TST     -(R2)           ;READ SECOND PARITY PATTERN
015124  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS ADDRESS A HIT?
015132  001532                          BEQ     T11H05          ;BRANCH IF NO TO ERROR
015134  005740                          TST     -(R0)           ;PUT NEW PARITY PATTERN IN TAG
015136  077107                          SOB     R1,T11H11       ;LOOK AT HALF OF CACHE

015140  005703                          TST     R3              ;FIRST PASS?
015142  001140                          BNE     T11H06          ;NO GO TO END OF TEST
015144  052703  000001                  BIS     #1,R3           ;SET FLAG TO INDIC. SECOND PASS
015150  012737  000204  177746  T11H12: MOV     #204,@#CCR      ;HALF CACHE ON IF OFF
015156  012737  015150  001110          MOV     #T11H12,@#$LPERR  ;SETUP RETURN FOR ERROR IF ONE OCCURS
015164  012700  056000                  MOV     #BUFH-4000,R0   ;SET UP FOR SECOND PASS.
015170  000723                          BR      T11H02          ;GO TEST SECOND PASS

015172                          T11H01:

                                        ;RID CACHE OF BAD PARITY
015172  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
015200  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE


015204  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
```



```
015206  076600                          MED                     ;GET CONTENTS OF LOG REG
015210  000022                          .WORD   RLOG
015212  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
015216  076600                          MED                     ;UNLOCK ERROR LOG
015220  000222                          .WORD   WLOG
015222  012600                          MOV     (SP)+,R0        ;RESTORE R0

015224  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
015226  000101                          .WORD   RSER
015230  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
015232  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
015236  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
015242  076600                          MED                     ;GET LOG INFORMATION
015244  000102                          .WORD   LOADD
015246  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
015252  076600                          MED                     ;GET LOG INFORMATION
015254  000100                          .WORD   RJAM
015256  032700  000400                  BIT     #400,R0         ;ERROR IN BACKING STORE?
015262  001410                          BEQ     T11H07          ;BRANCH IF NO
015264  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 WHERE ERROR OCCURRED
015270  162737  000002  001166          SUB     #2,$REG4        ;SAVE PC WHERE ERROR OCCURRED
015276  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
015300  104001                          ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
015302  000460                          BR      T11H06          ;GO TO NEXT TEST

015304  022626          T11H07: CMP     (SP)+,(SP)+     ;RESTORE STACK
015306  032737  000040  177744          BIT     #40,@#EREG      ;ERROR IN TAG?
015314  001411                          BEQ     T11H08          ;BRANCH NO
015316  076600                          MED                     ;GET TAG LOG INFO.
015320  000107                          .WORD   RTAG
015322  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
015324  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
015330  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
015334  104045                          ERROR   45              ;ERROR: TAG PARITY ERROR WHEN TESTING TAG P BIT
015336  000442                          BR      T11H06          ;GO TO NEXT TEST

015340  032737  000100  177744  T11H08: BIT     #100,@#EREG     ;ERROR IN LOW BYTE?
015346  001406                          BEQ     T11H09          ;BRANCH IF NO
015350  076600                          MED                     ;GET LOG INFORMATION
015352  000106                          .WORD   CDL
015354  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
015360  104046                          ERROR   46              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING TAG P BIT
015362  000430                          BR      T11H06          ;NEXT TEST

015364                          T11H09:
015364  076600                          MED                     ;GET LOG INFORMATION
015366  000106                          .WORD   CDH
015370  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
015374  104047                          ERROR   47              ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING TAG P BIT
015376  000422                          BR      T11H06          ;NEXT TEST

015400  052737  000014  177746  T11H04: BIS     #14,@#CCR       ;CACHE OFF
015406  162700  000002                  SUB     #2,R0           ;GET BAD ADDRESS
015412  010037  001162                  MOV     R0,$REG2        ;SAVE BAD ADDRESS
015416  000407                          BR      T11H10          ;REPORT ERROR
015420  052737  000014  177746  T11H05: BIS     #14,@#CCR       ;CACHE OFF
```

```
 2801  015476  010237  001162              MOV     R2,$REG2        ;SAVE BAD ADDRESS
 2802  015432  062702  000002              ADD     #2,R2           ;RESTORE R2 TO FAILING ADDR.+2
 2803  015436  005037  001160    T11H10:   CLR     $REG1           ;SAVE BAD ADDRESS
 2804  015442  104043                      ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
 2805
 2806  015444  012737  033142  000114    T11H06: MOV     #UPERR,@#PVEC   ;RESTORE PARITY TRAP HANDLER
 2807  015452  052737  000014  177746            BIS     #14,@#CCR       ;CACHE OFF WHEN CROSS CACHE ADDR. BOUNDARY
 2808  015460  000547                      BR      TST22           ;;GO TO NEXT TEST
 2809
 2810
 2811          016000                      .=16000                 ;ADJUST ADDRESS SPACE FOR NEXT TEST
 2812
 2813                                  ;;*************************************************************
 2814                                  ;*TEST 22        TEST TAG ADDRESS BITS FOR LOW HALF OF CACHE
 2815                                  ;*
 2816                                  ;*   THE TEST OF THE TAG BITS IS NOT COMPLETE UNTIL THE
 2817                                  ;*TAG ADDRESS TEST FOR THE OTHER HALF OF CACHE AND THE
 2818                                  ;*TEST OF THE MSB ADDRESS (A10) TO THE CACHE TAG FIELD
 2819                                  ;*ARE RUN.  A WRITE/READ PROCEDURE IS DONE WHICH CHECKS
 2820                                  ;*THE TAG FIELD BITS AND DUAL ADDRESSING ON THEM FOR HALF
 2821                                  ;*OF CACHE.  MEMORY IS FIRST SIZED TO DETERMINE THE MAX-
 2822                                  ;*IMUM TESTABLE ADDRESS.  THE TAG ADDRESS BITS OF THIS
 2823                                  ;*ADDRESS ARE USED AS PATTERN A AND STORED IN KIPAR4.  A
 2824                                  ;*PATTERN B IS NOW GENERATED WHICH HAS 'COMPLEMENT' TAG
 2825                                  ;*BITS AND STORED IN KIPAR5.  ON THE FIRST PASS, PATTERN
 2826                                  ;*A IS WRITTEN THROUGH HALF OF CACHE.  NEXT, STARTING AT
 2827                                  ;*THE HIGH HALF CACHE ADDRESS, THE LOCATION IS READ,
 2828                                  ;*CHECKED TO BE A HIT AND THEN WRITTEN WITH PATTERN B.
 2829                                  ;*THIS IS SEQUENTIALLY REPEATED WITH DECREASING ADDRESSES
 2830                                  ;*UNTIL THE LOW HALF CACHE ADDRESS IS REACHED.  AT THE
 2831                                  ;*LOW ADDRESS, THE SECOND PATTERN IS READ, CHECKED TO BE A
 2832                                  ;*HIT AND REWRITTEN WITH THE FIRST PATTERN.  THIS IS SE-
 2833                                  ;*QUENTIALLY REPEATED WITH INCREASING ADDRESSES UNTIL THE
 2834                                  ;*HIGH HALF CACHE ADDRESS IS REACHED.  A SECOND PASS IS
 2835                                  ;*THEN MADE WITH THE PATTERNS REVERSED.
 2836                                  ;*   ANY PARITY ERROR OR HIT ERROR IS REPORTED.
 2837                                  ;*   DURING THE PASSES, R0, R1 CONTAIN ADDRESSES WHICH
 2838                                  ;*REFERENCE KIPAR5,5.
 2839                                  ;*   R3 INDICATES THE PASS NUMBER.
 2840                                  ;*IF THE INHIBIT TESTS USING KT SWITCH (SW12) IS SET, THIS
 2841                                  ;*TEST IS SKIPPED.
 2842
 2843                                  ;;*************************************************************
 2844  016000  012737  000214  177746  TST22:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
 2845  016006  000004                          SCOPE
 2846  016010  012737  016646  001234          MOV     #TST23,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
 2847  016016  032777  010000  163110          BIT     #SW12,@#SWR     ;INHIBIT TESTS USING KT?
 2848  016024  001402                          BEQ     3$              ;CONTINUE TEST IF NO
 2849  016026  000137  016646                  JMP     @#TST23         ;GO TO NEXT TEST
 2850  016032  052737  000200  036034  3$:     BIS     #200,@#$KT11    ;KT ON FOR $SIZE
 2851  016040  004737  035750                  JSR     PC,$SIZE        ;SIZE MEMORY
 2852  016044  012737  016266  000114          MOV     #T13L01,@#PVEC  ;SET UP PARITY ERROR HANDLER
 2853  016052  013737  036322  172350          MOV     @#$LSTBK,@#KIPAR4  ;SET UP PAR4 FOR ADDRESS PATTERN A
 2854
 2855                                  ;CALC COMPLEMENT TAG PATTERN B
 2856
```



```
 2857  016060  013700  036322              MOV     @#$LSTBK,R0     ;GET TEST PATTERN A AND
 2858  016064  005100                      COM     R0              ;CALC PATTERN B
 2859  016066  005001                      CLR     R1
 2860  016070  005201            1$:       INC     R1
 2861  016072  006300                      ASL     R0
 2862  016074  100775                      BMI     1$
 2863  016076  006200            2$:       ASR     R0
 2864  016100  077102                      SOB     R1,2$
 2865  016102  042700  000037              BIC     #37,R0          ;ONLY COMPLEMENT TAG ADDR. BITS
 2866
 2867  016106  010037  172352              MOV     R0,@#KIPAR5     ;SET UP PAR5 FOR ADDRESS PATTERN B
 2868
 2869  016112  012700  100000              MOV     #100000,R0      ;INIT R0 TO ADD PATTERN A
 2870  016116  012701  122000              MOV     #122000,R1      ;INIT R1 TO ADD PATTERN B
 2871  016122  005003                      CLR     R3              ;INIT FLAG FOR PASS 1
 2872  016124  005004            T13L02:   CLR     R4              ;INIT INDICATOR FOR ERROR LOOP 1

 2873  016126  012702  001000              MOV     #1000,R2        ;INIT ADDR. COUNTER
 2874  016132  052737  000001  177572      BIS     #1,@#MMR0       ;TURN KT ON
 2875  016140  012737  000210  177746      MOV     #210,@#CCR      ;TURN HALF OF CACHE ON
 2876
 2877  016146  005720            1$:       TST     (R0)+           ;WRITE PATTERN IN CACHE
 2878  016150  077202                      SOB     R2,1$           ;ALL DONE? BRANCH IF NO
 2879
 2880  016152  012702  001000              MOV     #1000,R2        ;INIT. ADDR. COUNTER
 2881  016156  005740            T13L03:   TST     -(R0)           ;READ CACHE TAG BITS
 2882  016160  033727  177752  000004      BIT     @#HMR,#HMR2     ;HIT?
 2883  016166  001002                      BNE     2$              ;BRANCH  IF YES
 2884  016170  000137  016540              JMP     T13L04          ;REPORT ERROR
 2885  016174  005741            2$:       TST     -(R1)           ;WRITE NEW PATTERN IN TAG
 2886  016176  077211                      SOB     R2,T13L03               ;HALF ADDR. TESTED? BRANCH IF NO
 2887
 2888  016200  005204                      INC     R4              ;SET INDICATOR FOR ERROR LOOP 2
 2889  016202  012702  001000              MOV     #1000,R2        ;INIT. ADDR. COUNTER
 2890  016206  005711            T13L05:   TST     (R1)            ;READ CACHE TAG BITS
 2891  016210  033727  177752  000004      BIT     @#HMR,#HMR2     ;HIT?
 2892  016216  001002                      BNE     3$              ;BRANCH IF YES
 2893  016220  000137  016606              JMP     T13L06          ;REPORT ERROR
 2894  016224  005721            3$:       TST     (R1)+           ;UPDATE FOR NEXT ADDRESS
 2895  016226  005720                      TST     (R0)+           ;WRITE NEW PATTERN IN TAG
 2896  016230  077212                      SOB     R2,T13L05
 2897
 2898  016232  005703                      TST     R3              ;SECOND PASS?
 2899  016234  001402                      BEQ     2$              ;CONTINUE TEST IF NO
 2900  016236  000137  016634              JMP     T13L07          ;GO TO END OF TEST
 2901  016242  052703  000001    2$:       BIS     #1,R3           ;SET FLAG FOR SECOND PASS
 2902  016246  012737  016254  001110      MOV     #T13L15,@#$LPERR  ;INIT RETURN FOR ERROR LOOP IF ERROR OCCURS
 2903  016254  012700  120000    T13L15:   MOV     #120000,R0      ;INIT. R0 TO ADDR. PATTERN B
 2904  016260  012701  102000              MOV     #102000,R1      ;INIT. R1 TO ADDR. PATTERN A
 2905  016264  000717                      BR      T13L02          ;GO TEST SECOND PASS
 2906
 2907  016266  052737  000014  177746  T13L01: BIS     #14,@#CCR       ;CACHE OFF
 2908
 2909  016274  010046                      MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
 2910  016276  076600                      MED                     ;GET CONTENTS OF LOG REG
 2911  016300  000022                      .WORD   RLOG
 2912  016302  052700  100001              BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
```

```
2913  016306  076600                          MED                     ;UNLOCK ERROR LOG
2914  016310  000222                          .WORD   WLOG
2915  016312  012600                          MOV     (SP)+,R0        ;RESTORE R0
2916
2917  016314  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF TRAP
2918  016320  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC FOR MAIN PARITY ERROR
2919  016326  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
2920  016330  010046                          MOV     R0,-(SP)        ;SAVE R0 ON STACK FOR MED INST.
2921  016332  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR, A17,A16
2922  016334  000101                          .WORD   RSER
2923  016336  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
2924  016340  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
2925  016344  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
2926  016350  076600                          MED                     ;GET LOG INFORMATION
2927  016352  000102                          .WORD   LOADD
2928  016354  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
2929  016360  076600                          MED                     ;GET LOG INFORMATION
2930  016362  000100                          .WORD   RJAM
2931  016364  012600                          MOV     (SP)+,R0        ;RESTORE R0
2932  016366  032700  000400                  BIT     #400,R0         ;ERROR BACKING STORE?
2933  016372  001402                          BEQ     T13L08          ;BRANCH IF NO
2934  016374  104001                          ERROR   1               ;ERROR: UNEXPECT. PARITY ERROR IN BACKING STORE
2935  016376  000516                          BR      T13L07          ;GO TO END OF TEST
2936
2937  016400  011137  001166          T13L08: MOV     (R1),$REG4      ;SAVE GOOD DATA
2938  016404  005704                          TST     R4              ;ERROR IN LOOP 2?
2939  016406  001002                          BNE     T13L09          ;BRANCH IF YES
2940  016410  011037  001166                  MOV     (R0),$REG4      ;SAVE GOOD DATA
2941
2942  016414  032737  000040  177744  T13L09: BIT     #40,@#EREG      ;TAG PARITY ERROR?
2943  016422  001426                          BEQ     T13L10          ;BRANCH IF NO
2944  016424  004737  033634                  JSR     PC,PAR          ;GET PAR USED
2945  016430  000000                          .WORD   0               ;INDICATOR FOR R0
2946  016432  005704                          TST     R4              ;ERROR FROM LOOP 1?
2947  016434  001403                          BEQ     T13L11          ;BRANCH IF YES
2948  016436  004737  033634                  JSR     PC,PAR          ;GET PAR USED
2949  016442  000001                          .WORD   1               ;INDICATOR FOR R1
2950  016444  004737  033606          T13L11: JSR     PC,TAG          ;CALC TAG CONTENTS
2951  016450  013737  001172  001166          MOV     $TMP0,$REG4     ;SAVE GOOD DATA
2952  016456  076600                          MED                     ;GET TAG LOG INFO.
2953  016460  000107                          .WORD   RTAG
2954  016462  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
2955  016464  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
2956  016470  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
2957  016474  104052                          ERROR   52              ;ERROR: TAG PARITY ERROR ON TEST OF TAG ADDRESS BITS
2958  016476  000456                          BR      T13L07          ;GO TO END OF TEST
2959
2960  016500  032737  000100  177744  T13L10: BIT     #100,@#EREG     ;LOW BYTE P.E.?
2961  016506  001406                          BEQ     T13L12          ;BRANCH IF NO
2962  016510  076600                          MED                     ;GET LOG INFORMATION
2963  016512  000106                          .WORD   CDL
2964  016514  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
2965  016520  104053                          ERROR   53              ;ERROR: LOW BYTE PARITY ERROR ON TEST OF TAG ADDR. BITS
2966  016522  000444                          BR      T13L07          ;GO TO END OF TEST
2967
2968  016524                          T13L12:
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2969  016524  076600                          MED                     ;GET LOG INFORMATION
2970  016526  000106                          .WORD   CDH
2971  016530  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
2972  016534  104054                          ERROR   54              ;ERROR: HIGH BYTE PARITY ERROR ON TEST OF TAG ADDR. BITS
2973  016536  000436                          BR      T13L07          ;GO TO END OF TEST
2974
2975  016540  052737  000014  177746  T13L04: BIS     #14,@#CCR       ;CACHE OFF
2976  016546  010037  001172                  MOV     R0,$TMP0        ;GET VIRTUAL ADDRESS TESTED
2977  016552  004737  033434                  JSR     PC,VIP          ;SAVE ADDRESS TESTED
2978  016556  062700  000002                  ADD     #2,R0           ;ADJUST ADDRESS WHEN LOOP
2979  016562  004737  033634                  JSR     PC,PAR          ;GET PAR TESTED
2980  016566  000000                          .WORD   0               ;INDICATOR FOR R0
2981  016570  004737  033606          T13L13: JSR     PC,TAG          ;CALC TAG FROM PAR
2982  016574  013737  001172  001164          MOV     $TMP0,$REG3     ;SAVE TAG
2983  016602  104055                          ERROR   55              ;ERROR: TEST OF TAG ADDRESS BITS FAILED
2984                                                                  ;       ADDR. COULD NOT BE MADE A HIT
2985  016604  000413                          BR      T13L07          ;GO TO NEXT TEST
2986
2987  016606  052737  000014  177746  T13L06: BIS     #14,@#CCR       ;CACHE OFF
2988  016614  010137  001172                  MOV     R1,$TMP0        ;GET VIRTUAL ADDRESS TESTED
2989  016620  004737  033434                  JSR     PC,VIP          ;SAVE PHYSICAL ADDRESS TESTED
2990  016624  004737  033634                  JSR     PC,PAR          ;GET PAR TESTED
2991  016630  000001                          .WORD   1               ;INDICATOR FOR R1
2992  016632  000756                          BR      T13L13          ;REPORT ERROR
2993
2994
2995  016634  005037  177572          T13L07: CLR     @#MMR0          ;KT OFF
2996  016640  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE UNEXP. PARITY ERROR HANDLER
2997
2998                                  ;;**************************************************************
2999                                  ;*TEST 23        TEST OF CACHE DATA LOC WITH FLOAT 1 & 0 PATTERNS
3000                                  ;*
3001                                  ;*   THIS TEST MAKES TWO PASSES.  ON THE FIRST, A FLOAT
3002                                  ;*'1' PATTERN IS WRITTEN/READ FROM ONE CACHE LOC.  ON THE
3003                                  ;*SECOND, A FLOAT '0' PATTERN IS WRITTEN/READ FROM ONE
3004                                  ;*CACHE LOC.  THERE IS A HANDLER FOR PARITY ERRORS.  IF
3005                                  ;*THERE ARE LESS THAN 4 PARITY ERRORS THE TEST CONTINUES.
3006                                  ;*IF THERE ARE 4 OR MORE PARITY ERRORS THE TEST IS STOPPED.
3007                                  ;*   R0 CONTAINS THE DATA PATTERN
3008                                  ;*   R2 CONTAINS THE TEST ADDRESS
3009                                  ;*   R4 IS THE PASS INDICATOR
3010
3011                                  ;;**************************************************************
3012  016646  012737  000214  177746  TST23:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
3013  016654  000004                          SCOPE
3014  016656  012737  020000  001234          MOV     #TST24,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
3015  016664  012737  016760  000114          MOV     #T14L01,@#PVEC  ;SET UP PARITY ERROR HANDLER
3016  016672  005004                          CLR     R4              ;CLEAR PASS INDICATOR FOR FIRST PASS
3017  016674  012703  000001                  MOV     #1,R0           ;SET UP FLOAT 1 PATTERN
3018  016700  012702  060000                  MOV     #BUFL,R2        ;SET UP TEST ADDRESS
3019  016704  012737  000210  177746  T14L02: MOV     #210,@#CCR      ;HALF CACHE ON
3020  016712  010012                  T14L06: MOV     R0,(R2)         ;WRITE CACHE
3021  016714  020012                          CMP     R0,(R2)         ;READ CACHE
3022  016716  001151                          BNE     T14L03          ;BRANCH TO ERROR IF DATA BAD
3023  016720  005704                  T14L10: TST     R4              ;FIRST PASS?
3024  016722  001011                          BNE     T14L04          ;BRANCH IF NO
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3025  016721  005700                          TST     R0              ;ALL SHIFTS FOR FLOAT 1 PATTERN DONE?
3026  016726  100402                          BMI     T14L05          ;BRANCH IF YES
3027  016730  006300                          ASL     R0              ;SHIFT FLOAT 1 PATTERN
3028  016732  000767                          BR      T14L06          ;TEST IT
3029
3030  016734  052704  000001        T14L05: BIS     #1,R4           ;SET FLAG FOR SECOND PASS
3031  016740  012700  177776                  MOV     #177776,R0      ;SET UP FLOAT 0 PATTERN
3032  016744  000762                          BR      T14L06          ;GO TEST IT
3033
3034  016746  005700                  T14L04: TST     R0              ;ALL SHIFTS FOR FLOAT 0 PATTERN DONE?
3035  016750  100155                          BPL     T14L07          ;GO TO END OF TEST IF YES
3036  016752  000261                          SEC                     ;SET CARRY BIT FOR ROTATE
3037  016754  006100                          ROL     R0              ;ROTATE FLOAT 0 PATTERN
3038  016756  000755                          BR      T14L06          ;TEST IT
3039
3040  016760  052737  000014  177746  T14L01: BIS     #14,@#CCR       ;CACHE OFF
3041
3042  016766  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3043  016770  076600                          MED                     ;GET CONTENTS OF LOG REG
3044  016772  000022                          .WORD   RLOG
3045  016774  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
3046  017000  076600                          MED                     ;UNLOCK ERROR LOG
3047  017002  000222                          .WORD   WLOG
3048  017004  012600                          MOV     (SP)+,R0        ;RESTORE R0
3049
3050  017006  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF ERROR
3051  017012  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF ERROR
3052  017020  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
3053  017022  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3054  017024  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
3055  017026  000101                          .WORD   RSER
3056  017030  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
3057  017032  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
3058  017036  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
3059  017042  076600                          MED                     ;GET LOG INFORMATION
3060  017044  000102                          .WORD   LOADD
3061  017046  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
3062  017052  076600                          MED                     ;GET LOG INFORMATION
3063  017054  000100                          .WORD   RJAM
3064  017056  032700  000400                  BIT     #400,R0         ;ERROR IN BACKING STORE?
3065  017062  001403                          BEQ     T14L08          ;BRANCH IF NO
3066  017064  012600                          MOV     R0,(SP)+        ;RESTORE R0
3067  017066  104001                          ERROR   1               ;ERROR: UNEXPECT. PARITY ERROR IN BACKING STORE
3068  017070  000505                          BR      T14L07          ;GO TO END OF TEST
3069
3070  017072  011637  001166          T14L08: MOV     (SP),$REG4      ;SAVE GOOD DATA
3071  017076  012737  016704  001110          MOV     #T14L02,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
3072  017104  032737  000100  177744          BIT     #100,@#EREG     ;LOW BYTE PARITY ERROR?
3073  017112  001416                          BEQ     T14L09          ;BRANCH IF NO
3074  017114  076600                          MED                     ;GET LOG INFORMATION
3075  017116  000106                          .WORD   CDL
3076  017120  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3077  017124  012600                          MOV     (SP)+,R0        ;RESTORE R0
3078  017126  104056                          ERROR   56              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA FIELD
3079  017130  123727  001103  000003  T14L12: CMPB    @#ERFLG,#3      ;MORE THAN 3 ERRORS?
3080  017136  101062                          BHI     T14L07          ;STOP TESTING IF YES
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3081  017140  012737  000210  177746          MOV     #210,@#CCR      ;HALF CACHE ON
3082  017146  000664                          BR      T14L10          ;CONTINUE TEST
3083
3084  017150  033737  000200  177744  T14L09: BIT     200,@#EREG      ;HIGH BYTE P.E.?
3085  017156  001407                          BEQ     T14L11          ;BRANCH IF NO
3086  017160  076600                          MED                     ;GET LOG INFORMATION
3087  017162  000106                          .WORD   CDH
3088  017164  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3089  017170  012600                          MOV     (SP)+,R0        ;RESTORE R0
3090  017172  104057                          ERROR   57              ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA FIELD
3091  017174  000755                          BR      T14L12          ;SEE IF SHOULD CONTINUE TESTING
3092
3093  017176                          T14L11:
3094  017176  076600                          MED                     ;GET LOG INFORMATION
3095  017200  000107                          .WORD   CTAG
3096  017202  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3097  017206  012600                          MOV     (SP)+,R0        ;RESTORE R0
3098  017210  012737  050000  001166          MOV     #BUFL,$REG4     ;GET TESTED ADDRESS
3099  017216  012705  000013                  MOV     #13,R5          ;SETUP COUNTER
3100  017222  006737  001166          2$:     ASR     $REG4           ;PUT TAG ADDRESS BITS IN LSB 6-0
3101  017226  077503                          SOB     R5,2$           ;SHIFT NINE PLACES
3102  017230  052737  000200  001166          BIS     #200,$REG4      ;SET VALID BIT
3103  017236  104060                          ERROR   60              ;ERROR: TAG PARITY ERROR WHEN TESTING CACHE DATA FIELD
3104  017240  000733                          BR      T14L12          ;SEE IF WANT TO CONTINUE TEST
3105
3106  017242  011205                  T14L03: MOV     (R2),R5         ;GET BAD DATA
3107  017244  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
3108  017252  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
3109  017256  010237  001162                  MOV     R2,$REG2        ;SAVE ADDRESS
3110  017262  010537  001164                  MOV     R5,$REG3        ;SAVE BAD DATA
3111  017266  010037  001166                  MOV     R0,$REG4        ;SAVE GOOD DATA
3112  017272  012737  016704  001110          MOV     #T14L02,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
3113  017300  104061                          ERROR   61              ;ERROR: CACHE DATA LOC HELD WRONG DATA
3114  017302  000712                          BR      T14L12          ;SEE IF TEST TO BE CONTINUED
3115
3116  017304  012737  033142  000114  T14L07: MOV     #UPERR,@#PVEC   ;RESTORE HANDLER FOR UNEXP. PARITY ERRORS
3117  017312  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF WHEN CROSS CACHE ADDR. BOUNDARY
3118  017320  000137  020000                  JMP     @#TST24         ;GO TO NEXT TEST
3119
3120
3121          020000                          .=20000                 ;ADJUST ADDRESS SPACE FOR NEXT TEST
3122
3123
3124                                  ;;*****************************************************************
3125                                  ;*TEST 24        TEST DATA PARITY BITS FOR HIGH CACHE
3126                                  ;*
3127                                  ;*   THE TEST OF THE DATA PARITY BITS ARE NOT COMPLETE
3128                                  ;*UNTIL THE DATA P BIT TEST FOR THE SECOND HALF OF CACHE
3129                                  ;*AND THE MSB ADDRESS (A10) TO CACHE DATA FIELD ARE RUN.
3130                                  ;*A WRITE/READ PROCEDURE IS DONE WHICH SIMULTANEOUSLY
3131                                  ;*CHECKS THE DATA P BIT FOR BOTH BYTES AND DUAL ADDRESSING
3132                                  ;*IN HALF OF CACHE FOR IT.  INITIALLY THE P BIT IS WRITTEN
3133                                  ;*WITH ONE PARITY PATTERN IN HALF OF CACHE.  THEN STARTING
3134                                  ;*AT THE LOW HALF CACHE ADDRESS, THE LOC IS READ AND THEN
3135                                  ;*WRITTEN WITH THE OPPOSITE PARITY.  THIS IS  SEQUEN-
3136                                  ;*TIALLY REPEATED WITH INCREASING ADDRESSES UNTIL THE HIGH
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                                        ;*HALF CACHE ADDRESS IS REACHED.  THEN STARTING AT THE
                                        ;*HIGH ADDR, THE SECOND PARITY PATTERN IS READ AND THE LOC
                                        ;*IS REWRITTEN WITH THE FIRST.  THIS IS SEQUENTIALLY RE-
                                        ;*PEATED DECREASING THE ADDRESS UNTIL THE LOW HALF CACHE
                                        ;*ADDRESS IS REACHED.  A SECOND PASS IS THEN MADE WITH
                                        ;*THE PARITY PATTERN REVERSED.  A PARITY ERROR HANDLER IS
                                        ;*SETUP TO DETECT PARITY ERROPS.  ALSO, LOCS WHICH SHOULD
                                        ;*BE HITS ARE CHECKED FOR AND REPORTED IF NO HIT OCCURRED.
                                        ;*
                                        ;*R0, R1 CONTAIN DATA WHICH GENERATE OPPOSITE PARITY.  R3
                                        ;*INDICATES WHICH PASS IS BEING DONE.

                                        ;;*************************************************************
020000  012737  000214  177746  TST24:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
020006  000004                          SCOPE
020010  012737  020456  001234          MOV     #TST25,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
020016  012737  020200  000114          MOV     #T12H01,@#PVEC  ;SET UP PARITY ERROR HANDLER
020024  005003                          CLR     R3              ;INIT FLAG FOR FIRST PASS
020026  005000                          CLR     R0              ;SET UP PARITY PATTERN A FOR FIRST PASS
020030  012737  000204  177746  T12H02: MOV     #204,@#CCR      ;HALF CACHE ON
020036  012701  001000                  MOV     #1000,R1        ;INIT ADDR. COUNTER
020042  012705  062000                  MOV     #BUFH,R5        ;INIT. TEST ADDRESS
020046  010025          1$:     MOV     R0,(R5)+        ;WRITE DATA PARITY PATTERN
020050  077102                          SOB     R1,1$           ;HALF ADDR. WRITTEN? BRANCH IF NO

020052  012701  001000                  MOV     #1000,R1        ;INIT ADDR. COUNTER
020056  012705  062000                  MOV     #BUFH,R5        ;INIT. TEST ADDR
020062  012700  000401                  MOV     #401,R0         ;SET UP PATTERN B FOR FIRST PASS
020066  005703                          TST     R3              ;FIRST PASS?
020070  001401                          BEQ     2$              ;BRANCH IF YES
020072  005000                          CLR     R0              ;SET UP PARITY PATTERN A FOR SECOND PASS
020074  005715          2$:     TST     (R5)            ;SEE IF PARITY UNCHANGED
020076  033727  177752  000004          BIT     @#HMR,#HMR2     ;DATA FROM CACHE?
020104  001551                          BEQ     T12H07          ;BRANCH TO ERROR IF NO
020106  010025                          MOV     R0,(R5)+        ;WRITE NEW DATA PARITY PATTERN
020110  077107                          SOB     R1,2$           ;HALF ADDR. SPACE EXAMINED & WRITTEN?

020112  012701  001000                  MOV     #1000,R1        ;INIT ADDR. COUNTER
020116  005000                          CLR     R0              ;SET UP PARITY PATTERN A FOR FIRST PASS
020120  005703                          TST     R3              ;FIRST PASS?
020122  001402                          BEQ     T12H06          ;BRANCH IF YES
020124  012700  000401                  MOV     #401,R0         ;SET UP PARITY PATTERN B FOR SECOND PASS
020130  012737  000204  177746  T12H06: MOV     #204,@#CCR      ;HALF CACHE ON IF OFF FROM ERROR
020136  005745          1$:     TST     -(R5)           ;SEE IF PARITY UNCHANGED
020140  033727  177752  000004          BIT     @#HMR,#HMR2     ;DATA FROM CACHE
020146  001530                          BEQ     T12H07          ;BRANCH IF NO TO ERROR
020150  010015                          MOV     R0,(R5)         ;WRITE NEW PARITY PATTERN IN CACHE
020152  077107                          SOB     R1,1$           ;HALF OF ADDRESS SPACE READ & WRITTEN? BRANCH IF NO

020154  005703                          TST     R3              ;SECOND PASS?
020156  001134                          BNE     T12H08          ;GO TO END OF TEST IF YES
020160  012700  000401          T12H13: MOV     #401,R0         ;SET UP PARITY PATTERN B FOR SECOND PASS
020164  052703  000001                  BIS     #1,R3           ;SET FLAG FOR PASS 2
020170  012737  020160  001110          MOV     #T12H13,@##LPERR  ;INIT RETURN FOR ERROR LOOP IF ERROR OCCURS
020176  000714                          BR      T12H02          ;TEST DATA
```



```
020200  052737  000014  177746  T12H01: BIS     #14,@#CCR       ;CACHE OFF

020206  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
020210  076600                          MED                     ;GET CONTENTS OF LOG REG
020212  000022                          .WORD   RLOG
020214  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
020220  076600                          MED                     ;UNLOCK ERROR LOG
020222  000222                          .WORD   WLOG
020224  012600                          MOV     (SP)+,R0        ;RESTORE R0

020226  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
020230  000101                          .WORD   RSER
020232  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
020234  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
020240  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
020244  076600                          MED                     ;GET LOG INFORMATION
020246  000102                          .WORD   LOADD
020250  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
020254  032737  000040  177744          BIT     #40,@#EREG      ;ERROR IN TAG?
020262  001417                          BEQ     T12H09          ;BRANCH IF NO
020264  011637  001166                  MOV     (SP),$REG4      ;GET PC+2 OF ERROR
020270  162737  000002  001166          SUB     #2,$REG4        ;GET PC OF ERROR
020276  076600                          MED                     ;GET TAG LOG INFO.
020300  000107                          .WORD   RTAG
020302  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
020304  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
020310  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
020314  022626                          CMP     (SP)+,(SP)+     ;RESTORE THE STACK
020316  104002                          ERROR   2               ;ERROR: UNEXPECTED PARITY ERROR IN TAG FIELD
020320  000453                          BR      T12H08          ;GO TO END OF TEST

020322  022626          T12H09: CMP     (SP)+,(SP)+     ;RESTORE STACK
020324  005037  001166                  CLR     $REG4           ;SAVE GOOD DATA
020330  005700                          TST     R0              ;WAS TEST DATA =0?
020332  001003                          BNE     T12H11          ;BRANCH IF NO
020334  012737  000401  001166          MOV     #401,$REG4      ;SAVE GOOD DATA
020342  032737  000200  177744  T12H11: BIT     #200,@#EREG     ;ERROR IN HIGH BYTE?
020350  001406                          BEQ     T12H12          ;BRANCH IF NO
020352  076600                          MED                     ;GET LOG INFORMATION
020354  000106                          .WORD   CDH
020356  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
020362  104050                          ERROR   50              ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA P BITS
020364  000431                          BR      T12H08          ;GO TO END OF TEST

020366  032777  000100  157350  T12H12: BIT     #100,@#EREG     ;ERROR IN LOW BYTE?
020374  001406                          BEQ     T12H14          ;BRANCH IF NO
020376  076600                          MED                     ;GET LOG INFORMATION
020400  000106                          .WORD   CDL
020402  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
020406  104051                          ERROR   51              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA P BITS
020410  000417                          BR      T12H08          ;GO TO END OF TEST

020412  016637  177774  001164  T12H14: MOV     -4(SP),$REG3    ;GET PC+2 OF TRAP
020420  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF TRAP
020426  104001                          ERROR   1               ;ERROR: UNEXP. PARITY ERROR IN BACKING STORE
```

```
3249  020430  052737  000014  177746  T12H07: BIS     #14,@#CCR       ;CACHE OFF
3250  020436  010537  001162                  MOV     R5,$REG2        ;SAVE BAD ADDRESS
3251  020442  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
3252  020446  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
3253
3254  020450  012737  033142  000114  T12H08: MOV     $UPERR,@#PVEC   ;RESTORE PARITY ERROR HANDLER
3255
3256
3257
3258                                  ;;*************************************************************
3259                                  ;*TEST 25        TEST TAG ADDRESS BITS FOR HIGH HALF OF CACHE
3260                                  ;*
3261                                  ;*    THE TEST OF THE TAG BITS IS NOT COMPLETE UNTIL THE
3262                                  ;*TAG ADDRESS TEST FOR THE OTHER HALF OF CACHE AND THE
3263                                  ;*TEST OF THE MSB ADDRESS (A10) TO THE CACHE TAG FIELD
3264                                  ;*ARE RUN.  A WRITE/READ PROCEDURE IS DONE WHICH CHECKS
3265                                  ;*THE TAG FIELD BITS AND DUAL ADDRESSING ON THEM FOR HALF
3266                                  ;*OF CACHE.  MEMORY IS FIRST SIZED TO DETERMINE THE MAX-
3267                                  ;*IMUM TESTABLE ADDRESS.  THE TAG ADDRESS BITS OF THIS
3268                                  ;*ADDRESS ARE USED AS PATTERN A AND STORED IN KIPAR4.  A
3269                                  ;*PATTERN B IS NOW GENERATED WHICH HAS 'COMPLEMENT' TAG
3270                                  ;*BITS AND STORED IN KIPAR5.  ON THE FIRST PASS, PATTERN
3271                                  ;*A IS WRITTEN THROUGH HALF OF CACHE.  NEXT, STARTING AT
3272                                  ;*THE HIGH HALF CACHE ADDRESS, THE LOCATION IS READ,
3273                                  ;*CHECKED TO BE A HIT AND THEN WRITTEN WITH PATTERN B.
3274                                  ;*THIS IS SEQUENTIALLY REPEATED WITH DECREASING ADDRESSES
3275                                  ;*UNTIL THE LOW HALF CACHE ADDRESS IS REACHED.  AT THE
3276                                  ;*LOW ADDRESS, THE SECOND PATTERN IS READ, CHECKED TO BE A
3277                                  ;*HIT AND REWRITTEN WITH THE FIRST PATTERN.  THIS IS SE-
3278                                  ;*QUENTIALLY REPEATED WITH INCREASING ADDRESSES UNTIL THE
3279                                  ;*HIGH HALF CACHE ADDRESS IS REACHED.  A SECOND PASS IS
3280                                  ;*THEN MADE WITH THE PATTERNS REVERSED.
3281                                  ;*    ANY PARITY ERROR OR HIT ERROR IS REPORTED.
3282                                  ;*    DURING THE PASSES, R0, R1 CONTAIN ADDRESSES WHICH
3283                                  ;*REFERENCE KIPAR5,5.
3284                                  ;*    R3 INDICATES THE PASS NUMBER.
3285                                  ;*IF THE INHIBIT TESTS USING KT SWITCH (SW12) IS SET, THIS
3286                                  ;*TEST IS SKIPPED.
3287
3288                                  ;;*************************************************************
3289  020456  012737  000214  177746  TST25:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
3290  020464  000004                          SCOPE
3291  020466  012737  022000  001234          MOV     #TST26,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
3292  020474  032777  010000  160432          BIT     #SW12,@SWR      ;INHIBIT TESTS USING KT?
3293  020502  001402                          BEQ     3$              ;CONTINUE TEST IF NO
3294  020504  000137  022000                  JMP     @#TST26         ;GO TO NEXT TEST
3295  020510  052737  000200  036034  3$:     BIS     #200,@#$KT11    ;KT ON FOR $SIZE
3296  020516  004737  035750                  JSR     PC,$SIZE        ;SIZE MEMORY
3297  020522  012737  020744  000114          MOV     #T13H01,@#PVEC  ;SET UP PARITY ERROR HANDLER
3298  020530  013737  036322  172350          MOV     @#$LSTBK,@#KIPAR4  ;SET UP PAR4 FOR ADDRESS PATTERN A
3299
3300                                  ;CALC COMPLEMENT TAG PATTERN B
3301
3302  020536  013700  036322                  MOV     @#$LSTBK,R0     ;GET TEST PATTERN A AND
3303  020542  005100                          COM     R0              ;CALC PATTERN B
3304  020544  005001                          CLR     R1
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3305  020546  005201                  1$:     INC     R1
3306  020550  006300                          ASL     R0
3307  020552  100775                          BMI     1$
3308  020554  006200                  2$:     ASR     R0
3309  020556  077102                          SOB     R1,2$
3310  020560  042700  000037                  BIC     #37,R0          ;ONLY COMPLEMENT TAG ADDR. BITS
3311
3312  020564  010037  172352                  MOV     R0,@#KIPAR5     ;SET UP PAR5 FOR ADDRESS PATTERN B
3313
3314  020570  012700  102000                  MOV     #102000,R0      ;INIT R0 TO ADDR PATTERN A
3315  020574  012701  124000                  MOV     #124000,R1      ;INIT R1 TO ADDR PATTERN B
3316  020600  005003                          CLR     R3              ;INIT FLAG FOR PASS 1
3317  020602  005004                  T13H02: CLR     R4              ;INIT INDICATOR FOR ERROR LOOP 1
3318  020604  012702  001000                  MOV     #1000,R2        ;INIT ADDR. COUNTER
3319  020610  052737  000001  177572          BIS     #1,@#MMR0       ;TURN KT ON
3320  020616  012737  000204  177746          MOV     #204,@#CCR      ;TURN HALF OF CACHE ON
3321
3322  020624  005720                  1$:     TST     (R0)+           ;WRITE PATTERN IN CACHE
3323  020626  077202                          SOB     R2,1$           ;ALL DONE? BRANCH IF NO
3324
3325  020630  012702  001000                  MOV     #1000,R2        ;INIT. ADDR. COUNTER
3326  020634  005740                  T13H03: TST     -(R0)           ;READ CACHE TAG BITS
3327  020636  033727  177752  000004          BIT     @#MMR,$MMR2     ;HIT?
3328  020644  001002                          BNE     2$              ;BRANCH  IF YES
3329  020646  000137  021216                  JMP     T13H04          ;REPORT ERROR
3330  020652  005741                  2$:     TST     -(R1)           ;WRITE NEW PATTERN IN TAG
3331  020654  077211                          SOB     R2,T13H03               ;HALF ADDR. TESTED? BRANCH IF NO
3332
3333  020656  005204                          INC     R4              ;SET INDICATOR FOR ERROR LOOP 2
3334  020660  012702  001000                  MOV     #1000,R2        ;INIT. ADDR. COUNTER
3335  020664  005711                  T13H05: TST     (R1)            ;READ CACHE TAG BITS
3336  020666  033727  177752  000004          BIT     @#MMR,$MMR2     ;HIT?
3337  020674  001002                          BNE     3$              ;BRANCH IF YES
3338  020676  000137  021264                  JMP     T13H06          ;REPORT ERROR
3339  020702  005721                  3$:     TST     (R1)+           ;UPDATE FOR NEXT ADDRESS
3340  020704  005720                          TST     (R0)+           ;WRITE NEW PATTERN IN TAG
3341  020706  077212                          SOB     R2,T13H05
3342
3343  020710  005703                          TST     R3              ;SECOND PASS?
3344  020712  001402                          BEQ     2$              ;CONTINUE TEST IF NO
3345  020714  000137  021312                  JMP     T13H07          ;GO TO END OF TEST
3346  020720  052703  000001          2$:     BIS     #1,R3           ;SET FLAG FOR SECOND PASS
3347  020724  012737  020732  001110          MOV     #T13H15,@#$LPERR  ;INIT RETURN FOR ERROR LOOP IF ERROR OCCURS
3348  020732  012700  122000          T13H15: MOV     #122000,R0      ;INIT. R0 TO ADDR. PATTERN B
3349  020736  012701  104000                  MOV     #104000,R1      ;INIT. R1 TO ADDR. PATTERN A
3350  020742  000717                          BR      T13H02          ;GO TEST SECOND PASS
3351
3352  020744  052737  000014  177746  T13H01: BIS     #14,@#CCR       ;CACHE OFF
3353
3354  020752  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3355  020754  076600                          MED                     ;GET CONTENTS OF LOG REG
3356  020756  000022                          .WORD   RLOG
3357  020760  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
3358  020764  076600                          MED                     ;UNLOCK ERROR LOG
3359  020766  000222                          .WORD   WLOG
3360  020770  012600                          MOV     (SP)+,R0        ;RESTORE R0
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020772  011637  001164                    MOV     (SP),$REG3          ;GET PC+2 OF TRAP
020776  162737  000002  001164            SUB     #2,$REG3            ;SAVE PC FOR MAIN PARITY ERROR
021004  022626                            CMP     (SP)+,(SP)+         ;RESTORE STACK
021006  010046                            MOV     R0,-(SP)            ;SAVE R0 ON STACK FOR MED INST.
021010  076600                            MED                         ;GET LOG INFOR FOR PHY. ADDR. A17,A16
021012  000101                            .WORD   RSER
021014  000300                            SWAB    R0                  ;PUT PHY. ADDR A17, A16 IN LOW BYTE
021016  042700  177776                    BIC     #177776,R0          ;ONLY LOOK AT A17, A16
021022  010037  001160                    MOV     R0,$REG1            ;SAVE ADDRESS
021026  076600                            MED                         ;GET LOG INFORMATION
021030  000102                            .WORD   LOADD
021032  010037  001162                    MOV     R0,$REG2            ;SAVE INFORMATION
021036  076600                            MED                         ;GET LOG INFORMATION
021040  000100                            .WORD   RJAM
021042  012600                            MOV     (SP)+,R0            ;RESTORE R0
021044  032700  000400                    BIT     #400,R0             ;ERROR BACKING STORE?
021050  001402                            BEQ     T13H08              ;BRANCH IF NO
021052  104001                            ERROR   1                   ;ERROR: UNEXPECT. PARITY ERROR IN BACKING STORE
021054  000516                            BR      T13H07              ;GO TO END OF TEST

021056  011137  001166          T13H08: MOV     (R1),$REG4          ;SAVE GOOD DATA
021062  005704                            TST     R4                  ;ERROR IN LOOP 2?
021064  001002                            BNE     T13H09              ;BRANCH IF YES
021066  011037  001166                    MOV     (R0),$REG4          ;SAVE GOOD DATA

021072  032737  000040  177744  T13H09: BIT     #40,@#EREG          ;TAG PARITY ERROR?
021100  001426                            BEQ     T13H10              ;BRANCH IF NO
021102  004737  033634                    JSR     PC,PAR              ;GET PAR USED
021106  000000                            .WORD   0                   ;INDICATOR FOR R0
021110  005704                            TST     R4                  ;ERROR FROM LOOP 1?
021112  001403                            BEQ     T13H11              ;BRANCH IF YES
021114  004737  033634                    JSR     PC,PAR              ;GET PAR USED
021120  000001                            .WORD   1                   ;INDICATOR FOR R1
021122  004737  033606          T13H11: JSR     PC,TAG              ;CALC TAG CONTENTS
021126  013737  001172  001166            MOV     $TMP0,$REG4         ;SAVE GOOD DATA
021134  076600                            MED                         ;GET TAG LOG INFO.
021136  000107                            .WORD   RTAG
021140  000300                            SWAB    R0                  ;PUT TAG IN LOW BYTE
021142  042700  177400                    BIC     #177400,R0          ;LOOK AT TAG ONLY
021146  010037  001164                    MOV     R0,$REG3            ;SAVE BAD DATA
021152  104052                            ERROR   52                  ;ERROR: TAG PARITY ERROR ON TEST OF TAG ADDRESS BITS
021154  000456                            BR      T13H07              ;GO TO END OF TEST

021156  032737  000100  177744  T13H10: BIT     #100,@#EREG         ;LOW BYTE P.E.?
021164  001406                            BEQ     T13H12              ;BRANCH IF NO
021166  076600                            MED                         ;GET LOG INFORMATION
021170  000106                            .WORD   CDL
021172  010037  001164                    MOV     R0,$REG3            ;SAVE INFORMATION
021176  104053                            ERROR   53                  ;ERROR: LOW BYTE PARITY ERROR ON TEST OF TAG ADDR. BITS
021200  000444                            BR      T13H07              ;GO TO END OF TEST

021202                          T13H12:
021202  076600                            MED                         ;GET LOG INFORMATION
021204  000106                            .WORD   CDH
021206  010037  001164                    MOV     R0,$REG3            ;SAVE INFORMATION
```



```
021212  104054                            ERROR   54                  ;ERROR: HIGH BYTE PARITY ERROR ON TEST OF TAG ADDR. BITS
021214  000436                            BR      T13H07              ;GO TO END OF TEST

021216  052737  000014  177746  T13H04: BIS     #14,@#CCR           ;CACHE OFF
021224  010037  001172                    MOV     R0,$TMP0            ;GET VIRTUAL ADDRESS TESTED
021230  004737  033434                    JSR     PC,VIP              ;SAVE ADDRESS TESTED
021234  062700  000002                    ADD     #2,R0               ;ADJUST ADDRESS WHEN LOOP
021240  004737  033634                    JSR     PC,PAR              ;GET PAR TESTED
021244  000000                            .WORD   0                   ;INDICATOR FOR R0
021246  004737  033606          T13H13: JSR     PC,TAG              ;CALC TAG FROM PAR
021252  013737  001172  001164            MOV     $TMP0,$REG3         ;SAVE TAG
021260  104055                            ERROR   55                  ;ERROR: TEST OF TAG ADDRESS BITS FAILED
                                                                      ;       ADDR. COULD NOT BE MADE A HIT
021262  000413                            BR      T13H07              ;GO TO NEXT TEST

021264  052737  000014  177746  T13H06: BIS     #14,@#CCR           ;CACHE OFF

021272  010137  001172                    MOV     R1,$TMP0            ;GET VIRTUAL ADDRESS TESTED
021276  004737  033434                    JSR     PC,VIP              ;SAVE PHYSICAL ADDRESS TESTED
021302  004737  033634                    JSR     PC,PAR              ;GET PAR TESTED
021306  000001                            .WORD   1                   ;INDICATOR FOR R1
021310  000756                            BR      T13H13              ;REPORT ERROR

021312  005037  177572          T13H07: CLR     @#MMR0              ;KT OFF
021316  012737  033142  000114            MOV     #UPERR,@#PVEC       ;RESTORE UNEXPECTED PARITY ERROR HANDLER
021324  052737  000014  177746            BIS     #14,@#CCR           ;CACHE OFF WHEN CROSS CACHE ADDR. BOUNDARY
021332  000137  022000                    JMP     @#TST26             ;GO TO NEXT TEST


        022000                  .=22000                               ;ADJUST ADDRESS SPACE FOR NEXT TEST



                                ;;*************************************************************
                                ;*TEST 26        TEST DATA FIELD FOR LOW HALF OF CACHE
                                ;*
                                ;*   THE TEST OF THE DATA FIELD IS NOT COMPLETE UNTIL THE
                                ;*TEST OF THE DATA FIELD FOR THE OTHER HALF OF CACHE AND
                                ;*THE TEST OF THE MSB ADDRESS (A10) TO THE CACHE DATA
                                ;*FIELD ARE RUN.  A WRITE/READ PROCEDURE IS DONE WHICH
                                ;*CHECKS ALL THE DATA FIELD BITS AND DUAL ADDRESSING ON
                                ;*THEM FOR HALF OF CACHE.  ON THE FIRST PASS ONE PATTERN
                                ;*(CONTAINED IN R0) IS WRITTEN IN ALL THE DATA FIELDS.
                                ;*FOR HALF OF CACHE.  NEXT, STARTING AT THE HIGH HALF
                                ;*CACHE ADDRESS, THE LOCATION IS TESTED TO BE A HIT, ITS
                                ;*DATA IS CHECKED AND THEN WRITTEN WITH A SECOND PATTERN
                                ;*CONTAINED IN R1.  THIS IS SEQUENTIALLY REPEATED WITH
                                ;*DECREASING ADDRESSES UNTIL THE LOW HALF CACHE ADDRESS IS
                                ;*REACHED.  AT THE LOW ADDRESS, THE SECOND PATTERN IS READ,
                                ;*TESTED TO BE A HIT AND REWRITTEN WITH THE FIRST PATTERN.
                                ;*THIS IS SEQUENTIALLY REPEATED WITH INCREASING ADDRESSES
                                ;*UNTIL THE HIGH HALF CACHE ADDRESS IS REACHED.  A SECOND
                                ;*PASS IS THEN MADE WITH THE PATTERNS REVERSED.
                                ;*   ANY PARITY REEOR OR HIT ERROR IS REPORTED.
                                ;*   R0, R1        CONTAIN THE TEST PATTERN
                                ;*   R2            CONTAINS THE TEST ADDRESS
                                ;*   R4            CONTAINS THE PASS NUMBER
```

```
3473
3474                                    ;;*************************************************************
3475  022000  012737  000214  177746 TST26: MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
3476  022006  000004                       SCOPE
3477  022010  012737  024000  001234       MOV     #TST27,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
3478  022016  012737  022210  000114       MOV     #T15L01,@#PVEC  ;SET UP PARITY ERROR HANDLER
3479  022024  012700  125252              MOV     #125252,R0      ;SET UP DATA PATTERN A FOR PASS 1
3480  022030  012701  052525              MOV     #52525,R1       ;SET UP DATA PATTERN B FOR PASS 1
3481  022034  012737  000210  177746 T15L05: MOV     #210,@#CCR      ;HALF CACHE ON
3482  022042  005004                       CLR     R4              ;SET UP LOOP INDIC FOR ERROR LOOP 1
3483  022044  012702  060000              MOV     #BUFL,R2        ;INIT STARTING TEST ADDRESS
3484  022050  012703  001000              MOV     #1000,R3        ;INIT ADDRESS COUNTER
3485  022054  010022                1$:   MOV     R0,(R2)+        ;WRITE CACHE WITH PATTERN
3486  022056  077302                       SOB     R3,1$           ;LOOP TILL HALF CACHE WRITTEN
3487
3488                                    ;NOW READ AND WRITE PATTERN, DECREASING ADDRESS
3489
3490  022060  012703  001000              MOV     #1000,R3        ;INIT ADDRESS COUNTER
3491  022064  005742                T15L21: TST     -(R2)           ;READ CACHE
3492  022066  033727  177752  000004       BIT     @#HMR,$HMR2     ;HIT?
3493  022074  001002                       BNE     1$              ;BRANCH IF YES
3494  022076  000137  022466              JMP     T15L02          ;REPORT ERROR
3495  022102  021200                1$:   CMP     (R2),R0         ;IS DATA CORRECT?
3496  022104  001402                       BEQ     T15L17          ;BRANCH IF YES
3497  022106  000137  022510              JMP     T15L03          ;REPORT ERROR
3498  022112  010112                T15L17: MOV     R1,(R2)         ;WRITE NEW PATTERN IN CACHE
3499  022114  077315                       SOB     R3,T15L21       ;LOOP TILL HALF CACHE READ & WRITTEN
3500
3501                                    ;NOW READ AND WRITE PATTERN, INCREASING ADDRESS
3502
3503  022116  052704  000001              BIS     #1,R4           ;SET FLAG FOR ERROR LOOP 2
3504  022122  012703  001000              MOV     #1000,R3        ;INIT. ADDRESS COUNTER
3505  022126  005712                T15L22: TST     (R2)            ;READ CACHE
3506  022130  033727  177752  000004       BIT     @#HMR,$HMR2     ;HIT?
3507  022136  001002                       BNE     1$              ;BRANCH IF YES
3508  022140  000137  022466              JMP     T15L02          ;REPORT ERROR
3509  022144  021201                1$:   CMP     (R2),R1         ;DATA OK?
3510  022146  001402                       BEQ     T15L18          ;BRANCH IF YES
3511  022150  000137  022526              JMP     T15L15          ;REPORT ERROR
3512  022154  010022                T15L18: MOV     R0,(R2)+        ;WRITE NEW TEST PATTERN
3513  022156  077315                       SOB     R3,T15L22       ;LOOP TILL HALF OF CACHE READ & WRITTEN
3514
3515  022160  005700                       TST     R0              ;DOES R0 HAVE DATA FOR FIRST PASS?
3516  022162  100402                       BMI     T15L12          ;BRANCH IF YES
3517  022164  000137  022560              JMP     T15L04          ;GO TO END OF TEST
3518  022170  012700  052525        T15L12: MOV     #52525,R0       ;SET UP DATA PATTERN B FOR PASS 2.
3519  022174  012701  125252              MOV     #125252,R1      ;SET UP DATA PATTERN A FOR PASS 2
3520  022200  012737  022170  001110       MOV     #T15L12,@#$LPERR  ;INIT RETURN FOR ERROR LOOP IF ERROR
3521  022206  000712                       BR      T15L05          ;GO TEST IT
3522
3523  022210  052737  000014  177746 T15L01: BIS     #14,@#CCR       ;CACHE OFF
3524
3525  022216  010046                       MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3526  022220  076600                       MED                     ;GET CONTENTS OF LOG REG
3527  022222  000022                       .WORD   RLOG
3528  022224  052700  100001              BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
```



```
3529  022230  076600                       MED                     ;UNLOCK ERROR LOG
3530  022232  000222                       .WORD   WLOG
3531  022234  012600                       MOV     (SP)+,R0        ;RESTORE R0
3532
3533  022236  011637  001164              MOV     (SP),$REG3      ;GET PC+2 OF PARITY ERROR
3534  022242  162737  000002  001164       SUB     #2,$REG3        ;SAVE PC OF PARITY ERROR
3535  022250  022626                       CMP     (SP)+,(SP)+     ;RESTORE STACK
3536  022252  010046                       MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3537  022254  076600                       MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
3538  022256  000101                       .WORD   RSER
3539  022260  000300                       SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
3540  022262  042700  177776              BIC     #177776,R0      ;ONLY LOOK AT A17, A16
3541  022266  010037  001160              MOV     R0,$REG1        ;SAVE ADDRESS
3542  022272  076600                       MED                     ;GET LOG INFORMATION
3543  022274  000102                       .WORD   LOADD
3544  022276  010037  001162              MOV     R0,$REG2        ;SAVE INFORMATION
3545  022302  076600                       MED                     ;GET LOG INFORMATION
3546  022304  000100                       .WORD   RJAM
3547  022306  010005                       MOV     R0,R5   ;SAVE INFORMATION
3548  022310  012600                       MOV     (SP)+,R0        ;RESTORE R0
3549  022312  032705  000400              BIT     #400,R5         ;ERROR IN BACKING STORE?
3550  022316  001406                       BEQ     T15L06          ;BRANCH IF NO
3551  022320  076600                       MED                     ;GET LOG INFORMATION
3552  022322  055016                       .WORD   BSD
3553  022324  010037  001164              MOV     R0,$REG3        ;SAVE INFORMATION
3554  022330  104001                       ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
3555  022332  000512                       BR      T15L04          ;GO TO END OF TEST
3556
3557  022334  010137  001166        T15L06: MOV     R1,$REG4        ;SAVE GOOD DATA
3558  022340  005704                       TST     R4              ;ERROR LOOP 1?
3559  022342  001002                       BNE     T15L08          ;BRANCH IF NO
3560  022344  010037  001166              MOV     R0,$REG4        ;SAVE GOOD DATA
3561
3562  022350  032737  000100  177744 T15L08: BIT     #100,@#EREG     ;LOW BYTE PARITY ERROR?
3563  022356  001406                       BEQ     T15L13          ;BRANCH IF NO
3564  022360  076600                       MED                     ;GET LOG INFORMATION
3565  022362  000106                       .WORD   CDL
3566  022364  010037  001164              MOV     R0,$REG3        ;SAVE INFORMATION
3567  022370  104056                       ERROR   56              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA FIELD
3568  022372  000472                       BR      T15L04          ;GO TO END OF TEST
3569
3570  022374  032737  000200  177744 T15L13: BIT     #200,@#EREG     ;PARITY ERROR IN HIGH BYTE?
3571  022402  001406                       BEQ     T15L14          ;BRANCH IF NO
3572  022404  076600                       MED                     ;GET LOG INFORMATION
3573  022406  000106                       .WORD   CDH
3574  022410  010037  001164              MOV     R0,$REG3        ;SAVE INFORMATION
3575  022414  104057                       ERROR   57              ;ERROR: HIGH BYTE PARITY ERROR WHEN TEST DATA FIELD
3576  022416  000460                       BR      T15L04          ;GO TO END OF TEST
3577
3578  022420  010237  001166        T15L14: MOV     R2,$REG4        ;GET FAILING ADDRESS
3579  022424  012705  000013              MOV     #13,R5          ;SET UP COUNTER
3580  022430  006237  001166        2$:   ASR     $REG4           ;PUT TAG ADDRESS BITS IN LSB 6-0
3581  022434  077503                       SOB     R5,2$           ;LOOP TILL DONE
3582  022436  052737  000200  001166       BIS     #200,$REG4      ;SET VALID BIT
3583  022444  076600                       MED                     ;GET TAG LOG INFO.
3584  022446  000107                       .WORD   RTAG
```

```
3585  022450  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
3586  022452  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
3587  022456  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
3588  022462  104060                          ERROR   60              ;ERROR: TAG PARITY ERROR WHEN TESTING DATA FIELD
3589  022464  000435                          BR      T15L04          ;GO TO END OF TEST
3590
3591  022466  052737  000014  177746  T15L02: BIS     #14,@#CCR       ;CACHE OFF
3592  022474  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
3593  022500  010237  001162                  MOV     R2,$REG2        ;SAVE ADDRESS
3594  022504  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
3595  022506  000424                          BR      T15L04          ;GO TO END OF TEST
3596
3597  022510  011205                  T15L03: MOV     (R2),R5         ;GET BAD DATA
3598  022512  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
3599  022520  010037  001166                  MOV     R0,$REG4        ;SAVE GOOD DATA
3600  022524  000406                          BR      T15L16          ;REPORT ERROR
3601
3602  022526  011205                  T15L15: MOV     (R2),R5         ;GET BAD DATA
3603  022530  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
3604  022536  010137  001166                  MOV     R1,$REG4        ;SAVE GOOD DATA
3605  022542  005037  001160          T15L16: CLR     $REG1           ;SAVE ADDRESS
3606  022546  010237  001162                  MOV     R2,$REG2        ;SAVE ADDRESS
3607  022552  010537  001164                  MOV     R5,$REG3        ;SAVE BAD DATA
3608  022556  104061                          ERROR   61              ;ERROR: CACHE DATA LOC HELD WRONG DATA
3609
3610  022560  012737  033142  000114  T15L04: MOV     #UPERR,@#PVEC   ;RESTORE UNEXPECT. P.E. HANDLER
3611  022566  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF WHEN CROSS CACHE ADDR. BOUNDARY
3612  022574  000137  024000                  JMP     @#TST27         ;GO TO NEXT TEST
3613
3614
3615          024000                          .=24000                 ;ADJUST ADDRESS SPACE FOR NEXT TEST
3616
3617
3618
3619                                  ;;**************************************************************
3620                                  ;*TEST 27        TEST DATA FIELD FOR HIGH HALF OF CACHE
3621                                  ;*
3622                                  ;*   THE TEST OF THE DATA FIELD IS NOT COMPLETE UNTIL THE
3623                                  ;*TEST OF THE DATA FIELD FOR THE OTHER HALF OF CACHE AND
3624                                  ;*THE TEST OF THE MSB ADDRESS (A10) TO THE CACHE DATA
3625                                  ;*FIELD ARE RUN.  A WRITE/READ PROCEDURE IS DONE WHICH
3626                                  ;*CHECKS ALL THE DATA FIELD BITS AND DUAL ADDRESSING ON
3627                                  ;*THEM FOR HALF OF CACHE.  ON THE FIRST PASS ONE PATTERN
3628                                  ;*(CONTAINED IN R0) IS WRITTEN IN ALL THE DATA FIELDS.
3629                                  ;*FOR HALF OF CACHE.  NEXT, STARTING AT THE HIGH HALF
3630                                  ;*CACHE ADDRESS, THE LOCATION IS TESTED TO BE A HIT, ITS
3631                                  ;*DATA IS CHECKED AND THEN WRITTEN WITH A SECOND PATTERN
3632                                  ;*CONTAINED IN R1.  THIS IS SEQUENTIALLY REPEATED WITH
3633                                  ;*DECREASING ADDRESSES UNTIL THE LOW HALF CACHE ADDRESS IS
3634                                  ;*REACHED.  AT THE LOW ADDRESS, THE SECOND PATTERN IS READ,
3635                                  ;*TESTED TO BE A HIT AND REWRITTEN WITH THE FIRST PATTERN.
3636                                  ;*THIS IS SEQUENTIALLY REPEATED WITH INCREASING ADDRESSES
3637                                  ;*UNTIL THE HIGH HALF CACHE ADDRESS IS REACHED.  A SECOND
3638                                  ;*PASS IS THEN MADE WITH THE PATTERNS REVERSED.
3639                                  ;*   ANY PARITY REEOR OR HIT ERROR IS REPORTED.
3640                                  ;*   R0, R1     CONTAIN THE TEST PATTERN
```



```
3641                                  ;*   R2         CONTAINS THE TEST ADDRESS
3642                                  ;*   R4         CONTAINS THE PASS NUMBER
3643
3644                                  ;;**************************************************************
3645  024000  012737  000214  177746  TST27:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
3646  024006  000004                          SCOPE
3647  024010  012737  024566  001234          MOV     #TST30,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
3648  024016  012737  024210  000114          MOV     #T15H01,@#PVEC  ;SET UP PARITY ERROR HANDLER
3649  024024  012700  125252                  MOV     #125252,R0      ;SET UP DATA PATTERN A FOR PASS 1
3650  024030  012701  052525                  MOV     #52525,R1       ;SET UP DATA PATTERN B FOR PASS 1
3651  024034  012737  000204  177746  T15H05: MOV     #204,@#CCR      ;HALF CACHE ON
3652  024042  005004                          CLR     R4              ;SET UP LOOP INDIC FOR ERROR LOOP 1
3653  024044  012702  062000                  MOV     #BUFH,R2        ;INIT STARTING TEST ADDRESS
3654  024050  012703  001000                  MOV     #1000,R3        ;INIT ADDRESS COUNTER
3655  024054  010022                  1$:     MOV     R0,(R2)+        ;WRITE CACHE WITH PATTERN
3656  024056  077302                          SOB     R3,1$           ;LOOP TILL HALF CACHE WRITTEN
3657
3658                                  ;NOW READ AND WRITE PATTERN, DECREASING ADDRESS
3659
3660  024060  012703  001000                  MOV     #1000,R3        ;INIT ADDRESS COUNTER
3661  024064  005742                  T15H21: TST     -(R2)           ;READ CACHE
3662  024066  033727  177752  000004          BIT     @#HMR,$HMR2     ;HIT?
3663  024074  001002                          BNE     1$              ;BRANCH IF YES
3664  024076  000137  024466                  JMP     T15H02          ;REPORT ERROR
3665  024102  021200                  1$:     CMP     (R2),R0         ;IS DATA CORRECT?
3666  024104  001402                          BEQ     T15H17          ;BRANCH IF YES
3667  024106  000137  024510                  JMP     T15H03          ;REPORT ERROR
3668  024112  010112                  T15H17: MOV     R1,(R2)         ;WRITE NEW PATTERN IN CACHE
3669  024114  077315                          SOB     R3,T15H21       ;LOOP TILL HALF CACHE READ & WRITTEN
3670
3671                                  ;NOW READ AND WRITE PATTERN, INCREASING ADDRESS
3672
3673  024116  052704  000001                  BIS     #1,R4           ;SET FLAG FOR ERROR LOOP 2
3674  024122  012703  001000                  MOV     #1000,R3        ;INIT. ADDRESS COUNTER
3675  024126  005712                  T15H22: TST     (R2)            ;READ CACHE
3676  024130  033727  177752  000004          BIT     @#HMR,$HMR2     ;HIT?
3677  024136  001002                          BNE     1$              ;BRANCH IF YES
3678  024140  000137  024466                  JMP     T15H02          ;REPORT ERROR
3679  024144  021201                  1$:     CMP     (R2),R1         ;DATA OK?
3680  024146  001402                          BEQ     T15H18          ;BRANCH IF YES
3681  024150  000137  024526                  JMP     T15H15          ;REPORT ERROR
3682  024154  010022                  T15H18: MOV     R0,(R2)+        ;WRITE NEW TEST PATTERN
3683  024156  077315                          SOB     R3,T15H22       ;LOOP TILL HALF OF CACHE READ & WRITTEN
3684
3685  024160  005700                          TST     R0              ;DOES R0 HAVE DATA FOR FIRST PASS?
3686  024162  100402                          BMI     T15H12          ;BRANCH IF YES
3687  024164  000137  024560                  JMP     T15H04          ;GO TO END OF TEST
3688  024170  012700  052525          T15H12: MOV     #52525,R0       ;SET UP DATA PATTERN B FOR PASS 2.
3689  024174  012701  125252                  MOV     #125252,R1      ;SET UP DATA PATTERN A FOR PASS 2
3690  024200  012737  024170  001110          MOV     #T15H12,@#$LPERR  ;INIT RETURN FOR ERROR LOOP IF ERROR
3691  024206  000712                          BR      T15H05          ;GO TEST IT
3692
3693  024210  052737  000014  177746  T15H01: BIS     #14,@#CCR       ;CACHE OFF
3694
3695  024216  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3696  024220  076600                          MED                     ;GET CONTENTS OF LOG REG
```

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3697  024222  000022                          .WORD   RLOG
3698  024224  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
3699  024230  076600                          MED                     ;UNLOCK ERROR LOG
3700  024232  000222                          .WORD   WLOG
3701  024234  012600                          MOV     (SP)+,R0        ;RESTORE R0
3702
3703  024236  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF PARITY ERROR
3704  024242  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF PARITY ERROR
3705  024250  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
3706  024252  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3707  024254  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
3708  024256  000101                          .WORD   RSER
3709  024260  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
3710  024262  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
3711  024266  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
3712  024272  076600                          MED                     ;GET LOG INFORMATION
3713  024274  000102                          .WORD   LOADD
3714  024276  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
3715  024302  076600                          MED                     ;GET LOG INFORMATION
3716  024304  000100                          .WORD   RJAM
3717  024306  010005                          MOV     R0,R5   ;SAVE INFORMATION
3718  024310  012600                          MOV     (SP)+,R0        ;RESTORE R0
3719  024312  032705  000400                  BIT     #400,R5         ;ERROR IN BACKING STORE?
3720  024316  001406                          BEQ     T15H06          ;BRANCH IF NO
3721  024320  076600                          MED                     ;GET LOG INFORMATION
3722  024322  055F16                          .WORD   BSD
3723  024324  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3724  024330  104001                          ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
3725  024332  000512                          BR      T15H04          ;GO TO END OF TEST
3726
3727  024334  010137  001166          T15H06: MOV     R1,$REG4        ;SAVE GOOD DATA
3728  024340  005704                          TST     R4              ;ERROR LOOP 1?
3729  024342  001002                          BNE     T15H08          ;BRANCH IF NO
3730  024344  010037  001166                  MOV     R0,$REG4        ;SAVE GOOD DATA
3731
3732  024350  032737  000100  177744  T15H08: BIT     #100,@#EREG     ;LOW BYTE PARITY ERROR?
3733  024356  001406                          BEQ     T15H13          ;BRANCH IF NO
3734  024360  076600                          MED                     ;GET LOG INFORMATION
3735  024362  000106                          .WORD   CDL
3736  024364  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3737  024370  104056                          ERROR   56              ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA FIELD
3738  024372  000472                          BR      T15H04          ;GO TO END OF TEST
3739
3740  024374  032737  000200  177744  T15H13: BIT     #200,@#EREG     ;PARITY ERROR IN HIGH BYTE?
3741  024402  001406                          BEQ     T15H14          ;BRANCH IF NO
3742  024404  076600                          MED                     ;GET LOG INFORMATION
3743  024406  000106                          .WORD   CDH
3744  024410  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3745  024414  104057                          ERROR   57              ;ERROR: HIGH BYTE PARITY ERROR WHEN TEST DATA FIELD
3746  024416  000460                          BR      T15H04          ;GO TO END OF TEST
3747
3748  024420  010237  001166          T15H14: MOV     R2,$REG4        ;GET FAILING ADDRESS
3749  024424  012705  000013                  MOV     #13,R5          ;SET UP COUNTER
3750  024430  006237  001166          2$:     ASR     $REG4           ;PUT TAG ADDRESS BITS IN LSB 6-0
3751  024434  077503                          SOB     R5,2$           ;LOOP TILL DONE
3752  024436  052737  000200  001166          BIS     #200,$REG4      ;SET VALID BIT
```



```
3753  024444  076600                          MED                     ;GET TAG LOG INFO.
3754  024446  000107                          .WORD   RTAG
3755  024450  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
3756  024452  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
3757  024456  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
3758  024462  104060                          ERROR   60              ;ERROR: TAG PARITY ERROR WHEN TESTING DATA FIELD
3759  024464  000435                          BR      T15H04          ;GO TO END OF TEST
3760
3761  024466  052737  000014  177746  T15H02: BIS     #14,@#CCR       ;CACHE OFF
3762  024474  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
3763  024500  010237  001162                  MOV     R2,$REG2        ;SAVE ADDRESS
3764  024504  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
3765  024506  000424                          BR      T15H04          ;GO TO END OF TEST
3766
3767  024510  011205          T15H03: MOV     (R2),R5         ;GET BAD DATA
3768  024512  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
3769  024520  010037  001166                  MOV     R0,$REG4        ;SAVE GOOD DATA
3770  024524  000406                          BR      T15H16          ;REPORT ERROR
3771
3772  024526  011205          T15H15: MOV     (R2),R5         ;GET BAD DATA
3773  024530  052737  000014  177746          BIS     #14,@#CCR       ;CACHE OFF
3774  024536  010137  001166                  MOV     R1,$REG4        ;SAVE GOOD DATA
3775  024542  005037  001160          T15H16: CLR     $REG1           ;SAVE ADDRESS
3776  024546  010237  001162                  MOV     R2,$REG2        ;SAVE ADDRESS
3777  024552  010537  001164                  MOV     R5,$REG3        ;SAVE BAD DATA
3778  024556  104061                          ERROR   61              ;ERROR: CACHE DATA LOC HELD WRONG DATA
3779
3780  024560  012737  033142  000114  T15H04: MOV     #UPERR,@#PVEC   ;RESTORE UNEXPEC. PARITY ERROR HANDLER
3781
3782                                  ;;*****************************************************************
3783                                  ;*TEST 30        TEST OF MSB ADDRESS (A10) TO VALID BIT
3784                                  ;*
3785                                  ;*      THIS IS THE FIRST TEST WHERE ALL OF CACHE IS TURNED
3786                                  ;*ON.  THE TEST CHECKS FOR DUAL ADDRESSING ON THE VALID BIT FOR
3787                                  ;*THE MSB PHYSICAL ADDRESS (A10) TO CACHE.  INITIALLY TEST ADDRESSES
3788                                  ;*ARE CHOSEN WHICH HAVE THE CACHE ADDRESS BITS A1-A9 THE SAME
3789                                  ;*AND A10 COMPLEMENTS.  THE ADDRESSES ARE ALSO CHOSEN TO NOT OVERLAP
3790                                  ;*THE TEST INSTRUCTION SPACE.  THE FIRST ADDRESS IS AT THE END OF THIS
3791                                  ;*TEST INSTRUCTION SPACE (TAD2) AND THE SECOND IS CHOSEN BY THE
3792                                  ;*SUBROUTINE HAD TO LIE IN A 1 K BUFFER AT THE END OF THE PROGRAM.
3793                                  ;*      THE FIRST ADDRESS IS INVALIDATED VIA WWP AND FORCING A PARITY
3794                                  ;*TRAP.  THE SECOND IS THEN MADE VALID AND CHECKED TO BE A HIT.  THE FIRST IS
3795                                  ;*THEN EXAMINED TO STILL BE INVALID (NOT A HIT).  ANY PARITY OR HIT
3796                                  ;*ERROR IS REPORTED.
3797
3798                                  ;;*****************************************************************
3799  024566  012737  000214  177746  TST30:  MOV #214,@#CCR  ;CACHE OFF FOR SCOPE
3800  024574  000004                  SCOPE
3801  024576  012737  025244  001234          MOV     #TST31,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
3802  024604  012737  024646  000114          MOV     #T30L01,@#PVEC  ;SET UP FOR PARITY TRAP
3803  024612  004737  033714                  JSR     PC,HAD          ;CALC CONGRUENT ADDR. IN TEST BUFFER
3804  024616  025242                          .WORD   TAD2
3805  024620  013700  001172                  MOV     $TMP0,R0        ;SAVE ADDR.
3806  024624  012737  000300  177746          MOV     #300,@#CCR      ;CACHE ON & WWP
3807  024632  005010                          CLR     (R0)            ;WWP IN TEST ADDR.
3808  024634  012737  000200  177746          MOV     #200,@#CCR      ;WWP OFF
```

```
3809  024642  005710                          TST     (R0)            ;FORCE PARITY TRAP
3810  024644  000465                          BR      T30L02          ;REPORT FAILURE TO TRAP
3811
3812  024646                          T30L01:
3813
3814  024646  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3815  024650  076600                          MED                     ;GET CONTENTS OF LOG REG
3816  024652  000022                          .WORD   RLOG
3817  024654  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
3818  024660  076600                          MED                     ;UNLOCK ERROR LOG
3819  024662  000222                          .WORD   WLOG
3820  024664  012600                          MOV     (SP)+,R0        ;RESTORE R0
3821
3822  024666  062706  000004                  ADD     #4,SP           ;RESTORE STACK
3823  024672  012737  025042  000114          MOV     #T30L06,@#PVEC  ;SET UP PARITY ERROR HANDLER
3824  024700  023737  025242  025242          CMP     TAD2,TAD2       ;MAKE TEST ADDR A HIT
3825  024706  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT?
3826  024714  001427                          BEQ     T30L03          ;REPORT ERROR IF NO
3827  024716  005710                          TST     (R0)            ;CHECK OTHER LOC, STILL INVALIDATED
3828  024720  033727  177752  000004          BIT     @#HMR,#HMR2     ;MISS?
3829  024726  001011                          BNE     T30L04          ;REPORT ERROR IF NO
3830  024730                          T30L05:
3831
3832                                          ;RID CACHE OF BAD PARITY
3833  024730  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
3834  024736  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
3835
3836
3837  024742  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE UNEXP. PARITY ERROR HANDLER
3838  024750  000535                          BR      TST31           ;;GO TO NEXT TEST
3839
3840  024752  012737  000214  177746  T30L04: MOV     #214,@#CCR      ;CACHE OFF
3841  024760  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
3842  024764  010037  001162                  MOV     R0,$REG2        ;SAVE BAD ADDRESS
3843  024770  104121                          ERROR   121             ;ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED
3844                                                                  ;       LOC, NOT INVALIDATED
3845  024772  000756                          BR      T30L05          ;GO TO END OF TEST
3846
3847  024774  012737  000214  177746  T30L03: MOV     #214,@#CCR      ;CACHE OFF
3848  025002  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
3849  025006  012737  025242  001162          MOV     #TAD2,$REG2     ;SAVE BAD ADDRESS
3850  025014  104043                          ERROR   43              ;ERROR:ADDRESS COULD NOT BE MADE A HIT
3851  025016  000744                          BR      T30L05          ;GO TO END OF TEST
3852
3853  025020  012737  000214  177746  T30L02: MOV     #214,@#CCR      ;CACHE OFF
3854  025026  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
3855  025032  010037  001162                  MOV     R0,$REG2        ;SAVE BAD ADDRESS
3856  025036  104042                          ERROR   42              ;ERROR:NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PAR.
3857  025040  000733                          BR      T30L05          ;GO TO END OF TEST
3858
3859  025042  012737  000214  177746  T30L06: MOV     #214,@#CCR      ;CACHE OFF
3860
3861  025050  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
3862  025052  076600                          MED                     ;GET CONTENTS OF LOG REG
3863  025054  000022                          .WORD   RLOG
3864  025056  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
```



```
3865  025062  076600                          MED                     ;UNLOCK ERROR LOG
3866  025064  000222                          .WORD   WLOG
3867  025066  012600                          MOV     (SP)+,R0        ;RESTORE R0
3868
3869  025070  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF ERROR
3870  025074  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF ERROR
3871  025102  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
3872  025104  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
3873  025106  000101                          .WORD   RSER
3874  025110  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
3875  025112  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
3876  025116  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
3877  025122  076600                          MED                     ;GET LOG INFORMATION
3878  025124  000102                          .WORD   LOADD
3879  025126  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
3880  025132  076600                          MED                     ;GET LOG INFORMATION
3881  025134  000100                          .WORD   RJAM
3882  025136  032700  000400                  BIT     #400,R0         ;ERROR IN BACKING STORE?
3883  025142  001402                          BEQ     1$              ;BRANCH IF NO
3884  025144  104001                          ERROR   1               ;ERROR:UNEXP. PARITY ERROR IN BACKING STORE
3885  025146  000670                          BR      T30L05          ;GO TO END OF TEST
3886
3887  025150  032737  000040  177744  1$:     BIT     #40,@#EREG      ;PARITY ERROR TAG?
3888  025156  001411                          BEQ     2$              ;BRANCH IF NO
3889  025160  076600                          MED                     ;GET TAG LOG INFO.
3890  025162  000107                          .WORD   RTAG
3891  025164  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
3892  025166  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
3893  025172  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
3894  025176  104122                          ERROR   122             ;ERROR:TEST OF MSB ADDR. (A10) TO VALID BIT FAILED
3895                                                                  ;       PARITY ERROR TAG
3896  025200  000653                          BR      T30L05          ;GO TO END OF TEST
3897
3898  025202  032737  000100  177744  2$:     BIT     #100,@#EREG     ;PARITY ERROR LOW BYTE?
3899  025210  001406                          BEQ     3$              ;BRANCH IF NO
3900  025212  076600                          MED                     ;GET LOG INFORMATION
3901  025214  000106                          .WORD   CDL
3902  025216  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3903  025222  104123                          ERROR   123             ;ERROR:TEST OF MSB ADDR. (A10) TO VALID BIT FAILED
3904                                                                  ;       PARITY ERROR LOW BYTE
3905  025224  000641                          BR      T30L05          ;GO TO END OF TEST
3906
3907  025226                          3$:
3908  025226  076600                          MED                     ;GET LOG INFORMATION
3909  025230  000106                          .WORD   CDH
3910  025232  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
3911  025236  104124                          ERROR   124             ;ERROR:TEST OF MSB ADDR. (A10) TO VALID BIT FAILED
3912                                                                  ;       PARITY ERROR HIGH BYTE
3913  025240  000633                          BR      T30L05          ;GO TO END OF TEST
3914
3915  025242  000000                  TAD2:   .WORD   0               ;TEST ADDRESS
3916
3917                                  ;;*****************************************************************
3918                                  ;*TEST 31        TEST OF MSB ADDRESS (A10) TO CACHE TAG FIELD
3919                                  ;*
3920                                  ;*      THIS TEST CHECKS FOR DUAL ADDRESSING ON THE TAG
```

```
                                        ;*FIELD FOR THE MSB ADDRESS (A10) TO CACHE.  THERE ARE TWO
                                        ;*PASSES.  THE FIRST EXERCISES THE ADDRESS BITS IN THE TAG
                                        ;*FIELD AND THE SECOND EXERCISES THE TAG P BIT.  INITIALLY
                                        ;*THE MEMORY IS SIZED TO DETERMINE THE MAXIMUM TESTABLE
                                        ;*ADDRESS.  THE TAG FIELD OF THE MAX ADDR. IS USED AS THE
                                        ;*FIRST TEST VALUE AND ITS COMPLEMENT AS THE SECOND. THESE
                                        ;*TAG VALUES ARE THEN PUT INTO CACHE LOCATIONS WITH THE
                                        ;*SAME CACHE ADDRESS (A1-A9) EXCEPT FOR THEIR ADDRESS BIT
                                        ;*A10 COMPLEMENTS.  THE LOCS IN CACHE ARE CHOSEN SO THAT
                                        ;*THEY DON'T OVERLAP THE TEST INSTRUCTION ADDRESS SPACE.
                                        ;*THIS IS TO PREVENT THEIR BEING SWAPT OUT WHEN THE INSTRUC-
                                        ;*TIONS ARE BEING EXECUTED.  AFTER THE LOCATIONS ARE
                                        ;*WRITTEN THEY ARE EXAMINED AND CHECKED TO BE HITS.
                                        ;*FOLLOWING THIS THE SECOND PASS IS DONE FOR THE TAG P BIT.
                                        ;*TWO NEW TAG VALUES ARE CHOSEN WITH OPPOSITE P BITS.  THEY ARE
                                        ;*THEN WRITTEN, READ AND TESTED FOR HITS.  ANY PARITY ERRORS
                                        ;*OR HIT ERRORS ARE REPORTED.
                                        ;*   KIPAR4, 5 CONTAIN THE TAG VALUES WHICH ARE STORED IN
                                        ;*CACHE.
                                        ;*   R0, R1 CONTAIN THE CACHE TEST LOC THAT DON'T OVERLAP
                                        ;*THE INSTRUCTION ADDRESS SPACE
                                        ;*   R5 CONTAINS THE PASS #.
                                        ;*   IF THE INHIBIT TEST USING KT SWITCH (SW12) IS SET,
                                        ;*THIS TEST IS SKIPPED.

                                        ;;*************************************************************
025244  012737  000214  177746 TST31:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
025252  000004                         SCOPE
025254  012737  025750  001234         MOV     #TST32,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
025262  032777  010000  153644         BIT     #SW12,@SWR      ;INHIBIT TESTS USING KT?
025270  001402                         BEQ     3$              ;CONTINUE TEST IF NO
025272  000137  025750                 JMP     @#TST32         ;GO TO NEXT TEST
025276  012737  025534  000114 3$:     MOV     #T16L01,@#PVEC  ;SET UP PARITY ERROR HANDLER
025304  052737  000200  036034         BIS     #200,@#$KT11    ;USE KT FOR $SIZE
025312  004737  035750                 JSR     PC,$SIZE        ;SIZE MEMORY
025316  013700  036322                 MOV     @#$LSTBK,R0     ;GET LAST ADDRESS AND
025322  005100                         COM     R0              ;CALC. ITS COMPLEMENT
025324  005001                         CLR     R1              ;KEEPING THE MSB THAT ARE 0
025326  005201                 1$:     INC     R1              ;A 0
025330  006300                         ASL     R0
025332  100775                         BMI     1$
025334  006200                 2$:     ASR     R0
025336  077102                         SOB     R1,2$
025340  042700  000037                 BIC     #37,R0          ;ONLY COMPLEMENT TAG ADDRESS BITS
025344  010037  172352                 MOV     R0,@#KIPAR5     ;SET UP PAR5 WITH COMPLEMENT ADDRESS BITS
025350  013737  036322  172350         MOV     @#$LSTBK,@#KIPAR4 ;SET UP PAR4 WITH COMPLEMENT ADDRESS BITS

                                        ;SET UP R0,R1 TO ADDR. LOCS WHICH DON'T OVERLAP THIS TEST'S INSTRUCTION SPACE

025356  012700  025746                 MOV     #LAST1,R0       ;GET ADDR. OF LAST IN THIS TEST
025362  042700  174000                 BIC     #174000,R0      ;SAVE LOWER ADDR BITS A10-A0
025366  010001                         MOV     R0,R1           ;COPY ADDRESS
025370  062700  100000                 ADD     #100000,R0      ;HAVE R0 ADDR PAR4
025374  062701  122000                 ADD     #122000,R1      ;HAVE R1 ADDR PAR5 & HAVE A10 COMP OF R0
025400  005005                         CLR     R5              ;INDICATE PASS 1
025402  052737  000001  177572         BIS     #1,@#MMR0       ;KT ON
```



```
025410  012737  000200  177746 T16L05: MOV     #200,@#CCR      ;CACHE ON
025416  021011                         CMP     (R0),(R1)       ;GET LOC IN CACHE VIA DATI
025420  005710                         TST     (R0)            ;READ CACHE
025422  033727  177752  000004         BIT     @#HMR,#HMR2     ;SEE IF HIT
025430  001425                         BEQ     T16L02          ;BRANCH IF NO TO ERROR
025432  005711                         TST     (R1)            ;READ CACHE
025434  033727  177752  000004         BIT     @#HMR,#HMR2     ;HIT?
025442  001412                         BEQ     T16L03          ;BRANCH IF NO
025444  005705                         TST     R5              ;FIRST PASS?
025446  001131                         BNE     T16L04          ;BRANCH IF NO TO END OF TEST
025450  052705  000001                 BIS     #1,R5           ;SET FLAG FOR SECOND PASS
025454  005037  172350                 CLR     @#KIPAR4        ;SET UP PAR4 TO TEST P BIT
025460  012737  000040  172352         MOV     #40,@#KIPAR5    ;SET UP PAR5 TO TEST P BIT
025466  000750                         BR      T16L05          ;TEST IT

025470  052737  000014  177746 T16L03: BIS     #14,@#CCR       ;CACHE OFF

025476  010137  001172                 MOV     R1,$TMP0        ;GET VIRTUAL ADDRESS
025502  000405                         BR      T16L06          ;CONVERT VIRTUAL INTO PHYSICAL ADDR

025504  052737  000014  177746 T16L02: BIS     #14,@#CCR       ;CACHE OFF
025512  010037  001172                 MOV     R0,$TMP0        ;GET VIRTUAL ADDR.
025516  004737  033434         T16L06: JSR     PC,VIP          ;CHANGE VIRTUAL ADDRESS INTO PHYSICAL
025522  012737  025410  001110         MOV     #T16L05,@#$LPERR ;SETUP RETURN FOR ERROR LOOP
025530  104067                         ERROR   67              ;ERROR: TEST OF MSB ADDRESS (A10) TO TAG FIELD FAILED
                                        ;       ADDRESS COULD NOT BE MADE A HIT
025532  000477                         BR      T16L04          ;GO TO END OF TEST

025534  052737  000014  177746 T16L01: BIS     #14,@#CCR       ;CACHE OFF

025542  010046                         MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
025544  076600                         MED                     ;GET CONTENTS OF LOG REG
025546  000022                         .WORD   RLOG
025550  052700  100001                 BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
025554  076600                         MED                     ;UNLOCK ERROR LOG
025556  000222                         .WORD   WLOG
025560  012600                         MOV     (SP)+,R0        ;RESTORE R0

025562  011637  001164                 MOV     (SP),$REG3      ;GET PC+2 OF ERROR
025566  162737  000002  001164         SUB     #2,$REG3        ;SAVE PC OF ERROR
025574  022626                         CMP     (SP)+,(SP)+     ;RESTORE STACK
025576  076600                         MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
025600  000101                         .WORD   RSER
025602  000300                         SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
025604  042700  177776                 BIC     #177776,R0      ;ONLY LOOK AT A17, A16
025610  010037  001160                 MOV     R0,$REG1        ;SAVE ADDRESS
025614  076600                         MED                     ;GET LOG INFORMATION
025616  000102                         .WORD   LOADD
025620  010037  001162                 MOV     R0,$REG2        ;SAVE INFORMATION
025624  076600                         MED                     ;GET LOG INFORMATION
025626  000100                         .WORD   RJAM
025630  032700  000400                 BIT     #400,R0         ;ERROR IN BACKING STORE
025634  001402                         BEQ     T16L07          ;BRANCH IF NO
025636  104001                         ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
025640  000434                         BR      T16L04          ;GO TO END OF TEST

025642  032737  000040  177744 T16L07: BIT     #40,@#EREG      ;ERROR IN TAG FIELD?
```

```
4033  025650  001411                          BEQ     T16L0R          ;BRANCH IF NO
4034  025652  076600                          MED                     ;GET TAG LOG INFO.
4035  025654  000107                          .WORD   RTAG
4036  025656  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
4037  025660  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
4038  025664  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
4039  025670  104070                          ERROR   70              ;ERROR: TEST OF MSB ADDR. (A10) TO ADDRESS FIELD FAILED
4040                                                                  ;       TAG PARITY ERROR
4041  025672  000417                          BR      T16L04          ;GO TO END OF TEST
4042
4043  025674  032737  000100  177744  T16L08: BIT     #100,@#EREG     ;LOW BYTE P.E.?
4044  025702  001406                          BEQ     T16L09          ;BRANCH IF NO
4045  025704  076600                          MED                     ;GET LOG INFORMATION
4046  025706  000106                          .WORD   CDL
4047  025710  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
4048  025714  104071                          ERROR   71              ;ERROR: TEST OF MSB ADDR. (A10) TO ADDRESS FIELD FAILED
4049                                                                  ;       LOW BYTE PARITY ERROR
4050  025716  000405                          BR      T16L04          ;GO TO END OF TEST
4051
4052  025720                          T16L09:
4053  025720  076600                          MED                     ;GET LOG INFORMATION
4054  025722  000106                          .WORD   CDH
4055  025724  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
4056  025730  104072                          ERROR   72              ;ERROR: TEST OF MSB ADDR. (A10) TO TAG FIELD FAILED
4057                                                                  ;       HIGH BYTE PARITY ERROR
4058
4059  025732  005037  177572          T16L04: CLR     @#MMR0          ;KT OFF
4060  025736  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE PARITY ERROR HANDLER
4061  025744  000401                          BR      TST32           ;;GO TO NEXT TEST
4062
4063  025746  000000                  LAST1:  .WORD   0               ;TEST ADDRESS LOCATION
4064
4065                                  ;;*****************************************************************
4066                                  ;*TEST 32       TEST OF MSB ADDRESS (A10) TO CACHE DATA FIELD
4067                                  ;*
4068                                  ;*   THIS TEST CHECKS FOR DUAL ADDRESSING ON THE DATA FIELD
4069                                  ;*FOR THE MSB (A10) ADDRESS TO CACHE.  THERE ARE TWO PASSES.
4070                                  ;*THE FIRST EXERCISES THE DATA BITS AND THE SECOND EXERCISES
4071                                  ;*THE DATA PARITY BITS.  THE TEST DATA IS STORED IN A TABLE
4072                                  ;*(TPAT) AT THE END OF THE TEST.  INITIALLY TEST ADDRESSES
4073                                  ;*ARE CALCULATED WHICH DON'T OVERLAP THE TEST INSTRUCTIONS
4074                                  ;*AND WHICH HAVE THE SAME CACHE ADDRESS (A1-A9) EXCEPT FOR
4075                                  ;*A10.  ONE ADDRESS IS THE LAST LOC IN THIS TEST (TAD1)
4076                                  ;*AND THE SECOND LIES IN A 1K BUFFER AT THE END OF THE
4077                                  ;*PROGRAM.  A SUBROUTINE, HAD, GENERATES THIS SECOND ADDRESS.
4078                                  ;*ON THE FIRST PASS DIFFERENT TEST DATA IS WRITTEN IN THE
4079                                  ;*CONGRUENT ADDRESS AND THEN CHECKED TO BE A HIT AND TO
4080                                  ;*BE THE CORRECT VALUE.  ON THE SECOND PASS NEW DATA IS
4081                                  ;*CHOSEN, WHICH GENERATES OPPOSITE PARITY IN THE DATA FIELD,
4082                                  ;*IS WRITTEN IN THE ADDRESSES AND THEN CHECKED TO BE A HIT
4083                                  ;*AND TO BE THE CORRECT VALUE.  ANY PARITY ERRORS OR HIT
4084                                  ;*ERRORS ARE REPORTED.
4085                                  ;*   R2 CONTAINS THE CONGRUENT ADDRESS FOR TAD1
4086
4087                                  ;;*****************************************************************
4088  025750  012737  000214  177746  TST32:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
```



```
4089  025756  000004                          SCOPE
4090  025760  012737  026444  001234          MOV     #TST33,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4091  025766  012737  026224  000114          MOV     #T17L01,@#PVEC  ;SET UP FOR PARITY ERRORS
4092  025774  004737  033714                  JSR     PC,HAD          ;CALC CONGRUENT ADDRESS IN TEST BUFFER
4093  026000  026442                          .WORD   TAD1            ;TEST ADDRESS
4094  026002  013702  001172                  MOV     @TMP0,R2        ;SAVE CONGRUENT ADDRESS
4095  026006  005000                          CLR     R0              ;INIT TEST PATTERN ADDRESS REG
4096  026010  012737  000200  177746  T17L08: MOV     #200,@#CCR      ;ALL CACHE ON
4097  026016  016037  026432  026442  T17L07: MOV     TPAT(R0),@#TAD1 ;WRITE CACHE LOCS WITH
4098  026024  016012  026436                  MOV     TPAT+4(R0),(R2) ;ADDRESS BIT A10 COMPLEMENTED
4099  026030  013701  026442                  MOV     @#TAD1,R1       ;SEE IF DATA IN CACHE
4100  026034  033727  177752  000004          BIT     @#HMR,$HMR2     ;HIT?
4101  026042  001420                          BEQ     T17L02          ;BRANCH IF NO TO ERROR
4102  026044  020160  026432                  CMP     R1,TPAT(R0)     ;DATA CORRECT?
4103  026050  001051                          BNE     T17L03          ;BRANCH IF NO TO ERROR
4104  026052  011201                          MOV     (R2),R1         ;SEE IF NEXT DATA IN CACHE
4105  026054  033727  177752  000004          BIT     @#HMR,$HMR2     ;HIT?
4106  026062  001425                          BEQ     T17L04          ;BRANCH IF NO TO ERROR
4107  026064  020160  026436                  CMP     R1,TPAT+4(R0)   ;DATA OK?
4108  026070  001030                          BNE     T17L05          ;BRANCH IF NO TO ERROR
4109  026072  005760  026436                  TST     TPAT+4(R0)      ;TEST IF FIRST PASS
4110  026076  100151                          BPL     T17L06          ;BRANCH TO END OF TEST IF NO
4111  026100  005720                          TST     (R0)+           ;UPDATE ADDRESS
4112  026102  000745                          BR      T17L07          ;GO TEST NEW DATA
4113
4114  026104  052737  000014  177746  T17L02: BIS     #14,@#CCR       ;CACHE OFF
4115  026112  012737  026442  001162          MOV     @TAD1,$REG2     ;SAVE ADDRESS
4116  026120  012737  026010  001110  T17L09: MOV     #T17L08,@#@#LPERR ;INIT. RETURN FOR ERROR LOOP
4117  026126  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
4118  026132  104062                          ERROR   62              ;ERROR: TEST OF MSB ADDRESS (A10) TO DATA FIELD FAILED
4119                                                                  ;       ADDRESS COULD NOT BE MADE A HIT
4120  026134  000532                          BR      T17L06          ;GO TO END OF TEST
4121
4122  026136  052737  000014  177746  T17L04: BIS     #14,@#CCR       ;CACHE OFF
4123  026144  010237  001162                  MOV     R2,@REG2        ;SAVE ADDRESS
4124  026150  000763                          BR      T17L09          ;REPORT ERROR
4125
4126  026152  052737  000014  177746  T17L05: BIS     #14,@#CCR       ;CACHE OFF
4127  026160  016037  026436  001166          MOV     TPAT+4(R0),$REG4 ;SAVE GOOD DATA
4128  026166  010237  001162                  MOV     R2,$REG2        ;SAVE BAD ADDRESS
4129  026172  000406                          BR      T17L10          ;REPORT ERROR
4130
4131  026174  052737  000014  177746  T17L03: BIS     #14,@#CCR       ;CACHE OFF
4132  026202  016037  026432  001166          MOV     TPAT(R0),$REG4  ;SAVE GOOD DATA
4133  026210  010137  001164          T17L10: MOV     R1,$REG3        ;SAVE BAD DATA
4134  026214  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
4135  026220  104063                          ERROR   63              ;ERROR: TEST OF MSB ADDR. (A10) TO DATA FIELD FAILED
4136                                                                  ;       ADDRESS HELD WRONG DATA
4137  026222  000477                          BR      T17L06          ;GO TO END OF TEST
4138
4139  026224  052737  000014  177746  T17L01: BIS     #14,@#CCR       ;CACHE OFF
4140
4141  026232  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4142  026234  076600                          MED                     ;GET CONTENTS OF LOG REG
4143  026236  000022                          .WORD   RLOG
4144  026240  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
```

```
4145  026244  076600                          MED                     ;UNLOCK ERROR LOG
4146  026246  000222                          .WORD   WLOG
4147  026250  012600                          MOV     (SP)+,R0        ;RESTORE R0
4148
4149  026252  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF ERROR
4150  026256  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF ERROR
4151  026264  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
4152  026266  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
4153  026270  000101                          .WORD   RSER
4154  026272  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
4155  026274  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
4156  026300  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
4157  026304  076600                          MED                     ;GET LOG INFORMATION
4158  026306  000102                          .WORD   LOADD
4159  026310  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
4160  026314  076600                          MED                     ;GET LOG INFORMATION
4161  026316  000100                          .WORD   RJAM
4162  026320  032700  000400                  BIT     #400,R0         ;ERROR IN BACKING STORE
4163  026324  001402                          BEQ     T17L11          ;BRANCH IF NO
4164  026326  104001                          ERROR   1               ;ERROR: UNEXP. PARITY ERROR IN BACKING STORE
4165  026330  000434                          BR      T17L06          ;GO TO END OF TEST
4166
4167  026332  032737  000100  177744  T17L11: BIT     #100,@#EREG     ;PARITY ERROR LOW BYTE?
4168  026340  001406                          BEQ     T17L12          ;BRANCH IF NO
4169  026342  076600                          MED                     ;GET LOG INFORMATION
4170  026344  000106                          .WORD   CDL
4171  026346  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
4172  026352  104064                          ERROR   64              ;ERROR: TEST OF MSB  ADDR. (A10) TO DATA FIELD FAILED
                                                                        ;       PARITY ERROR LOW BYTE
4173
4174  026354  000422                          BR      T17L06          ;GO TO END OF TEST
4175
4176  026356  032737  000200  177744  T17L12: BIT     #200,@#EREG     ;PARITY ERROR HIGH BYTE?
4177  026364  001406                          BEQ     T17L13          ;BRANCH IF NO
4178  026366  076600                          MED                     ;GET LOG INFORMATION
4179  026370  000106                          .WORD   CDL
4180  026372  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
4181  026376  104065                          ERROR   65              ;ERROR: TEST OF MSB ADDR. (A10) TO DATA FIELD FAILED
                                                                        ;       PARITY ERROR HIGH BYTE
4182
4183  026400  000410                          BR      T17L06          ;GO TO END OF TEST
4184
4185  026402                          T17L13:
4186  026402  076600                          MED                     ;GET TAG LOG INFO.
4187  026404  000107                          .WORD   RTAG
4188  026406  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
4189  026410  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
4190  026414  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
4191  026420  104066                          ERROR   66              ;ERROR: TEST OF MSB ADDR. (A10) TO DATA FIELD FAILED
                                                                        ;       PARITY ERROR TAG
4192
4193
4194  026422  012737  033142  000114  T17L06: MOV     #UPERR,@#PVEC   ;RESTORE PARITY ERROR HANDLER
4195  026430  000405                          BR      TST33           ;;GO TO NEXT TEST
4196
4197
4198  026432  066666                  TPAT:   .WORD   66666           ;TEST DATA FOR DATA BIT TEST
4199  026434  000401                          .WORD   401             ;TEST DATA FOR PARITY BIT TEST
4200  026436  111111                          .WORD   111111          ;TEST DATA FOR DATA BIT TEST
```



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4201  026440  001403                          .WORD   1403            ;TEST DATA FOR PARITY BIT TEST
4202
4203  026442  000000                  TAD1:   .WORD   0       ;TEST ADDRESS
4204
4205                                  ;;*****************************************************************
4206                                  ;*TEST 33        TEST CACHE IS NOT ALLOCATED DURING ODD ADDRESS TRAP
4207                                  ;*
4208                                  ;*THIS TEST FIRST PUTS DATA IN A CACHE LOC.  THEN A WORD
4209                                  ;*INSTRUCTION TO AN ODD BYTE ADDRESS TRIES TO CLEAR THE
4210                                  ;*LOC AND FORCE AN ODD ADDRESS ERROR.  UPON TRAPPING, THE
4211                                  ;*LOC IN CACHE IS LOOKED AT AND VERIFIED TO NOT HAVE CHANGED.
4212
4213                                  ;;*****************************************************************
4214  026444  012737  000214  177746  TST33:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4215  026452  000004                  SCOPE
4216  026454  012737  026634  001234          MOV     #TST34,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4217  026462  012737  000200  177746          MOV     #200,@#CCR      ;CACHE ON
4218  026470  012737  026510  000004          MOV     #T27L01,@#4     ;SETUP FOR ODD ADDRESS TRAP
4219  026476  012737  177777  060000          MOV     #177777,@#BUFL  ;PUT DATA IN CACHE
4220  026504  005037  060001                  CLR     @#BUFL+1        ;FORCE ODD ADDRESS ERROR
4221
4222  026510  022626                  T27L01: CMP     (SP)+,(SP)+     ;RESTORE THE STACK
4223
4224  026512  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4225  026514  076600                          MED                     ;GET CONTENTS OF LOG REG
4226  026516  000022                          .WORD   RLOG
4227  026520  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4228  026524  076600                          MED                     ;UNLOCK ERROR LOG
4229  026526  000222                          .WORD   WLOG
4230  026530  012600                          MOV     (SP)+,R0        ;RESTORE R0
4231
4232  026532  013700  060000                  MOV     @#BUFL,R0       ;GET DATA
4233  026536  033727  177752  000004          BIT     @#HMR,@#HMR2    ;HIT?
4234  026544  001407                          BEQ     T27L02          ;BRANCH TO ERROR IF NO
4235  026546  020027  177777                  CMP     R0,#177777      ;DATA UNCHANGED?
4236  026552  001016                          BNE     T27L03          ;BRANCH IF YES TO ERROR
4237  026554  012737  033352  000004  T27L04: MOV     #UT4,@#4        ;RESTORE HANDLER FOR UNEXPECTED TRAPS TO 4
4238  026562  000424                          BR      TST34           ;;GO TO NEXT TEST
4239
4240  026564  052737  000014  177746  T27L02: BIS     #14,@#CCR       ;CACHE OFF
4241  026572  005037  001160                  CLR     $REG1           ;SAVE FAILING ADDRESS
4242  026576  012737  060000  001162          MOV     #BUFL,$REG2     ;SAVE FAILING ADDRESS
4243  026604  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
4244  026606  000762                          BR      T27L04          ;GO TO END OF TEST
4245
4246  026610  032737  000014  177746  T27L03: BIT     #14,@#CCR       ;CACHE OFF
4247  026616  005037  001160                  CLR     $REG1           ;SAVE BAD ADDRESS
4248  026622  012737  060001  001162          MOV     #BUFL+1,$REG2   ;SAVE BAD ADDRESS
4249  026630  104116                          ERROR   116             ;ERROR: CACHE ALLOCATED DURING ODD ADDRESS TRAP
4250  026632  000750                          BR      T27L04          ;GO TO END OF TEST
4251
4252                                  ;;*****************************************************************
4253                                  ;*TEST 34        TEST CACHE NOT ALLOCATED DURING RED ZONE TRAP
4254                                  ;*
4255                                  ;*   THIS TEST FIRST PUTS DATA IN A CACHE LOC WHICH COR-
4256                                  ;*RESPONDS TO A RED ZONE ADDRESS.  A STACK OPERATION IS
```

```
4257                                    ;*DONE TO THIS ADDRESS WHICH WILL CHANGE THE DATA IF
4258                                    ;*COMPLETED.  UPON TRAPPING, THE DATA IN CACHE IS LOOKED
4259                                    ;*AT AND VERIFIED TO NOT HAVE CHANGED.
4260
4261                                    ;;*************************************************************
4262  026634  012737  000214  177746  TST34:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4263  026642  000004                          SCOPE
4264  026644  012737  027030  001234          MOV     #TST35,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4265  026652  012737  000200  177746          MOV     #200,@#CCR      ;CACHE ON
4266  026660  012737  026706  000004          MOV     #T28L01,@#4     ;SET UP FOR RED ZONE TRAPS
4267  026666  005037  177774                  CLR     @#177774        ;INITIALIZE THE STACK LIMIT REG
4268  026672  005037  000336                  CLR     @#336           ;INITIALIZE TEST LOC
4269  026676  012706  000336                  MOV     #336,SP         ;PUT RED ZONE TRAP ADDRESS IN STACK PTER
4270  026702  012716  177777                  MOV     #177777,(SP)    ;FORCE RED ZONE TRAP
4271
4272  026706  012706  001100          T28L01: MOV     #1100,SP        ;RESTORE THE STACK
4273
4274  026712  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4275  026714  076600                          MED                     ;GET CONTENTS OF LOG REG
4276  026716  000022                          .WORD   RLOG
4277  026720  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4278  026724  076600                          MED                     ;UNLOCK ERROR LOG
4279  026726  000222                          .WORD   WLOG
4280  026730  012600                          MOV     (SP)+,R0        ;RESTORE R0
4281
4282  026732  013700  000336                  MOV     @#336,R0        ;GET DATA
4283  026736  033727  177752  000004          BIT     @#HMR,@#HMR2    ;HIT?
4284  026744  001412                          BEQ     T28L02          ;BRANCH IF NO
4285  026746  005700                          TST     R0              ;DATA UNCHANGED?
4286  026750  001022                          BNE     T28L03          ;BRANCH IF NO TO ERROR
4287  026752  012737  033352  000004  T28L04: MOV     #UT4,@#4        ;RESTORE HANDLER FOR UNEXP. TRAPS TO 4
4288  026760  005037  000000                  CLR     @#0             ;RESTORE LOC 0
4289  026764  005037  000002                  CLR     @#2             ;RESTORE LOC 2
4290  026770  000417                          BR      TST35           ;;GO TO NEXT TEST
4291
4292  026772  052737  000014  177746  T28L02: BIS     #14,@#CCR       ;CACHE OFF
4293  027000  005037  001160                  CLR     $REG1           ;SAVE FAILING ADDR.
4294  027004  012737  000336  001162          MOV     #336,$REG2      ;SAVE FAILING ADDR.
4295  027012  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
4296  027014  000756                          BR      T28L04          ;GO TO END OF TEST
4297
4298  027016  052737  000014  177746  T28L03: BIS     #14,@#CCR       ;CACHE OFF
4299  027024  104117                          ERROR   117             ;ERROR: CACHE ALLOCATED DURING RED ZONE TRAP
4300  027026  000751                          BR      T28L04          ;GO TO END OF TEST
4301
4302                                    ;;*************************************************************
4303                                    ;*TEST 35        TEST CACHE NOT ALLOCATED DURING KT ABORT
4304                                    ;*
4305                                    ;*   DATA IS PUT IN CACHE IN A TEST BUFFER ADDRESS.  KIPAR4
4306                                    ;*IS SET UP TO  REFERENCE THAT ADDRESS AND KIPDR4 IS SET
4307                                    ;*UP TO ABORT ACCESSES TO NON RESIDENT PAGE.  THE KT IS
4308                                    ;*TURNED ON AND A MEMORY REFERENCE THROUGH KIPAR4 IS MADE
4309                                    ;*WHICH WOULD MODIFY THE TEST LOCATION IF COMPLETED.  UPON
4310                                    ;*TRAPPING, THE LOCATION IS LOOKED AT AND VERIFIED TO NOT
4311                                    ;*HAVE CHANGED.
4312                                    ;*   IF THE INHIBIT TEST USING KT SWITCH (SW12) IS SET,
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4313                                    ;*THIS TEST IS SKIPPED.
4314
4315                                    ;;*************************************************************
4316  027030  012737  000014  177746  TST35:  MOV     #14,@#CCR       ;CACHE OFF FOR SCOPE
4317  027036  000004                          SCOPE
4318  027040  012737  027300  001234          MOV     #TST36,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4319  027046  032777  010000  152060          BIT     #SW12,@$SWR     ;INHIBIT TESTS USING KT?
4320  027054  001114                          BNE     TST36           ;;YES, GO TO NEXT TEST
4321  027056  052737  000200  036034          BIS     #200,@#$KT11    ;USE KT FOR $SIZE
4322  027064  004737  035750                  JSR     PC,$SIZE        ;USE $SIZE TO SET UP PAR'S AND PDR'S
4323  027070  012737  027152  000250          MOV     #T29L01,@#250   ;SET UP FOR KT ABORTS
4324  027076  012737  077400  172310          MOV     #77400,KIPDR4   ;SET UP PDR4 TO ABORT ACCESS TO NON RESIDENT PAGE
4325  027104  012700  060000                  MOV     #BUFL,R0        ;GET TEST ADDRESS
4326  027110  042700  160000                  BIC     #160000,R0      ;MASK ITS PAR ADDRESS
4327  027114  052700  100000                  BIS     #100000,R0      ;HAVE IT ADDRESS PAR4
4328  027120  013737  172346  172350          MOV     @#KIPAR3,@#KIPAR4  ;INIT PAR4 TO HAVE SAME OFFSET AS PAR3 FOR THE BUFFER
4329  027126  012737  000200  177746          MOV     #200,@#CCR      ;CACHE ON
4330  027134  012737  177777  060000          MOV     #177777,@#BUFL  ;INIT TEST ADDRESS
4331  027142  052737  000001  177572          BIS     #1,@#MMR0       ;KT ON
4332  027150  005010                          CLR     (R0)            ;FORCE KT ABORT
4333
4334  027152  022626                  T29L01: CMP     (SP)+,(SP)+     ;RESTORE STACK
4335
4336  027154  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4337  027156  076600                          MED                     ;GET CONTENTS OF LOG REG
4338  027160  000022                          .WORD   RLOG
4339  027162  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4340  027166  076600                          MED                     ;UNLOCK ERROR LOG
4341  027170  000222                          .WORD   WLOG
4342  027172  012600                          MOV     (SP)+,R0        ;RESTORE R0
4343
4344  027174  013701  060000                  MOV     @#BUFL,R1       ;GET ADDRESS
4345  027200  033727  177752  000004          BIT     @#HMR,@#HMR2    ;HIT?
4346  027206  001415                          BEQ     T29L02          ;BRANCH IF NO
4347  027210  020127  177777                  CMP     R1,#177777      ;DATA OK?
4348  027214  001024                          BNE     T29L03          ;BRANCH IF NO
4349  027216  042737  000001  177572  T29L04: BIC     #1,@#MMR0       ;KT OFF
4350  027224  052737  000006  172310          BIS     #6,@#KIPDR4     ;ALLOW READ OR WRITE TO PAGE
4351  027232  012737  000252  000250          MOV     #252,@#250      ;RESTORE KT TRAP CATCHER
4352  027240  000417                          BR      TST36           ;;GO TO NEXT TEST
4353
4354  027242  052737  000014  177746  T29L02: BIS     #14,@#CCR       ;CACHE OFF
4355  027250  005037  001160                  CLR     $REG1           ;SAVE FAILING ADDRESS
4356  027254  012737  060000  001160          MOV     #BUFL,$REG1     ;SAVE FAILING ADDRESS
4357  027262  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
4358  027264  000754                          BR      T29L04          ;GO TO END OF TEST
4359
4360  027266  052737  000014  177746  T29L03: BIS     #14,@#CCR       ;CACHE OFF
4361  027274  104120                          ERROR   120             ;ERROR: CACHE ALLOCATED DURING KT ABORT
4362  027276  000747                          BR      T29L04          ;GO TO END OF TEST
4363
4364
4365                                    ;;*************************************************************
4366                                    ;*TEST 36        DYNAMIC TEST OF CACHE
4367                                    ;*
4368                                    ;*   THIS TEST CREATES A GREAT DEAL OF ACTIVITY IN CACHE
                                        ;*TO TRY TO FIND ANY NOISE OR TIMING PROBLEMS.  THESE
```

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4369                                    ;*PROBLEMS WILL BE DETECTED VIA THE PARITY ERRORS, ILLEGAL
4370                                    ;*INSTRUCTION TRAPS OR DATA CHANGES THEY CAUSE.  FIRST
4371                                    ;*CACHE IS LOADED WITH AN ALTERNATING DATA PATTERN (525,252).
4372                                    ;*THEN IT IS REFERENCED AS QUICKLY AS POSSIBLE IN OPPOSITE
4373                                    ;*DIRECTIONS TO CAUSE LARGE CHANGES IN THE ADDRESS LINES AND
4374                                    ;*RAPID CHANGES IN THE DATA LINES.  THIS IS THEN REPEATED
4375                                    ;*WITH A DIFFERENT DATA PATTERN AND THE CACHE IS MODIFIED
4376                                    ;*AS THE REFERENCES OCCUR.  AFTER THIS THE LOCATIONS ARE
4377                                    ;*CHECKED TO CONTAIN THEIR PROPER VALUES.
4378                                    ;*    FOLLOWING THIS, THE TAG FIELD IS WRITTEN WITH A
4379                                    ;*CHANGING PATTERN.  THEN THE CACHE IS REFERENCED AS QUICKLY
4380                                    ;*AS POSSIBLE IN OPPOSITE DIRECTIONS TO CAUSE LARGE CHANGES
4381                                    ;*IN THE ADDRESS LINES AND RAPID CHANGES IN THE TAG FIELD.
4382                                    ;*THIS LAST PART IS SKIPPED IF THE INHIBIT TEST USING KT
4383                                    ;*SWITCH (SW12) IS SET.
4384
4385                                    ;;*************************************************************
4386  027300  012737  000214  177746 TST36:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4387  027306  000004                  SCOPE
4388  027310  012737  030260  001234         MOV     #TST37,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4389  027316  012737  030036  000114         MOV     #T18L01,@#PVEC  ;SETUP FOR PARITY ERRORS
4390  027324  012737  027710  000010         MOV     #T18L02,@#10    ;SETUP FOR TRAPS TO ILLEGAL INST
4391  027332  012737  027340  001110         MOV     #T18L11,@#$LPERR ;INIT RETURN FOR ERROR LOOPS
4392  027340  012737  000200  177746 T18L11: MOV     #200,@#CCR      ;CACHE ON
4393
4394                                    ;GENERATE TEST DATA IN A 1K BUFFER
4395
4396  027346  012703  060000                 MOV     #BUFL,R3        ;GET STARTING ADDRESS OF BUFFER
4397  027352  012702  002000                 MOV     #2000,R2        ;INIT REG FOR 1K COUNT
4398  027356  012701  176540                 MOV     #176540,R1      ;PUT RANDOM # IN REG
4399  027362  012700  023456                 MOV     #023456,R0      ;PUT RANDOM # IN REG
4400  027366  060001                  1$:    ADD     R0,R1           ;GENERATE NEW RANDOM DATA
4401  027370  010123                         MOV     R1,(R3)+        ;SAVE DATA
4402  027372  000261                         SEC                     ;GENERATE MORE
4403  027374  006101                         ROL     R1              ;RANDOM DATA
4404  027376  006000                         ROR     R0
4405  027400  077206                         SOB     R2,1$           ;LOOP TILL 1K BUFFER FULL
4406
4407                                    ;LOAD CACHE WITH PATTERN AND TEST CACHE
4408
4409  027402  012700  060000                 MOV     #BUFL,R0        ;SET UP TO ADDRESS BUFFER
4410  027406  012701  060000                 MOV     #BUFL,R1        ;ASET UP TO ADDRESS BUFFER
4411  027412  012702  002000                 MOV     #2000,R2        ;INIT REG FOR 1K COUNT
4412  027416  012703  002000                 MOV     #2000,R3        ;INIT REG FOR 1K COUNT
4413  027422  005721                  2$:    TST     (R1)+           ;GET DATA IN CACHE
4414  027424  077202                         SOB     R2,2$           ;LOOP TILL 1K REFERENCED
4415  027426  022041                  3$:    CMP     (R0)+,-(R1)     ;REFERENCE CACHE QUICKLY AND WITH COMPLEMENT ADDR
4416  027430  077302                         SOB     R3,3$           ;LOOP TILL ALL CACHE REFERENCED
4417
4418                                    ;GENERATE SECOND TEST PATTERN IN BUFFER AND TEST IT
4419
4420  027432  012700  060000                 MOV     #BUFL,R0        ;SET UP TO ADDRESS BUFFER
4421  027436  012701  060000                 MOV     #BUFL,R1        ;SET UP TO ADDRESS BUFFER
4422  027442  012702  002000                 MOV     #2000,R2        ;INIT REG FOR 1K COUNT
4423  027446  012703  002000                 MOV     #2000,R3        ;INIT REG FOR 1K COUNT
4424  027452  005004                         CLR     R4              ;INIT DATA
```



```
4425  027454  010421                  5$:    MOV     R4,(R1)+        ;LOAD BUFFER WITH PATTERN
4426  027456  005204                         INC     R4              ;CHANGE DATA
4427  027460  077203                         SOB     R2,5$           ;LOOP TILL 1K LOADED
4428
4429  027462  062041                  6$:    ADD     (R0)+,-(R1)     ;REFERENCE CACHE QUICKLY
4430  027464  077302                         SOB     R3,6$           ;LOOP TILL ALL CACHE REFERENCED
4431
4432                                    ;CHECK DATA IN CACHE OR MAIN MEM CORRECT
4433
4434  027466  012701  001777                 MOV     #1777,R1        ;INIT REG WITH GOOD DATA
4435  027472  012702  001000                 MOV     #1000,R2        ;INIT REG FOR 1/2K COUNT
4436  027476  014003                  7$:    MOV     -(R0),R3        ;GET DATA
4437  027500  020103                         CMP     R1,R3           ;DATA OK?
4438  027502  001140                         BNE     T18L03          ;BRANCH IF NO TO ERROR
4439  027504  077204                         SOB     R2,7$           ;LOOP TILL 1/2K REFERRED
4440  027506  012702  001000                 MOV     #1000,R2        ;INIT REG FOR 1/2K COUNT
4441  027512  012701  002776                 MOV     #2776,R1        ;INIT REG WITH 'GOOD' DATA
4442  027516  014003                  10$:   MOV     -(R0),R3        ;GET DATA
4443  027520  020103                         CMP     R1,R3           ;DATA OK?
4444  027522  001130                         BNE     T18L03          ;BRANCH IF NO TO ERROR
4445  027524  005301                         DEC     R1              ;ADJUST GOOD DATA
4446  027526  077205                         SOB     R2,10$          ;LOOP TILL ALL DATA CHECKED
4447
4448                                    ;NOW TEST TAG MEM
4449
4450  027530  032777  010000  151376         BIT     #SW12,@SWR      ;INHIBIT TESTS USING KT?
4451  027536  001402                         BEQ     11$             ;CONTINUE TEST IF NO
4452  027540  000137  030260                 JMP     @#TST37         ;GO TO NEXT TEST
4453  027544  052737  000200  036034 11$:    BIS     #200,@#$KT11    ;KT ON FOR $SIZE
4454  027552  004737  035750                 JSR     PC,$SIZE        ;SIZE MEMORY
4455  027556  013737  027564  001110         MOV     T18L05,@#$LPERR ;INIT RETURN FOR ERROR LOOPS
4456  027564  012737  000200  177746 T18L05: MOV     #200,@#CCR      ;CACHE ON
4457  027572  012700  100000                 MOV     #100000,R0      ;HAVE R0 ADDRESS PAR4
4458  027576  012701  120000                 MOV     #120000,R1      ;HAVE R1 ADDR. PAR5
4459  027602  012704  172350                 MOV     #KIPAR4,R4      ;PUT PAR4 ADDR IN R4
4460  027606  012705  172352                 MOV     #KIPAR5,R5      ;PUT PAR5 ADDR IN R5
4461  027612  013702  036322                 MOV     @#$LSTBK,R2     ;GET LAST BANK
4462  027616  010215                         MOV     R2,(R5)         ;SET UP PAR5
4463  027620  010214                  T18L06: MOV     R2,(R4)         ;SET UP PAR4
4464  027622  052737  000001  177572         BIS     #1,@#MMR0       ;KT ON
4465  027630  005720                  T18L07: TST     (R0)+           ;WRITE CACHE VIA DATI
4466  027632  032700  003776                 BIT     #3776,R0        ;ALL CACHE WRITTEN?
4467  027636  001404                         BEQ     T18L09          ;BRANCH IF YES
4468  027640  162714  000040                 SUB     #40,(R4)        ;CALC NEW PAR4 TO GIVE NEW TAG PATTERN
4469  027644  100371                         BPL     T18L07          ;WRITE CACHE IF TAG > OR EQUAL TO 0
4470  027646  000764                         BR      T18L06          ;GO INIT PAR4 TO RESTART PATTERN
4471
4472  027650  022140                  T18L09: CMP     (R1)+,-(R0)     ;REFERENCE CACHE
4473  027652  032701  003776                 BIT     #3776,R1        ;ALL CACHE TESTED?
4474  027656  001002                         BNE     2$              ;BRANCH IF NO TO CONTINUE
4475  027660  000137  030234                 JMP     T18L10          ;GO TO END OF TEST
4476  027664  162715  000040         2$:     SUB     #40,(R5)        ;ADJUST PAR5 FOR NEXT TEST ADDR. REF.
4477  027670  100001                         BPL     1$              ;TAG > OR EQUAL 0, BRANCH IF YES
4478  027672  010215                         MOV     R2,(R5)         ;NO, INIT PAR5 FOR HIGHEST TAG ADDR
4479  027674  062714  000040         1$:     ADD     #40,(R4)        ;ADJUST PAR4 FOR NEXT TEST ADDR.
4480  027700  020214                         CMP     R2,(R4)         ;IS PAR4 > MAX ADDRESS?
```

```
4481  030702  002362                          BGE     T18L09          ;GO TEST IT IF NO
4482  030704  005014                          CLR     (R4)            ;RESTART PAR4 AT LOW TEST ADDR
4483  030706  000760                          BR      T18L09          ;GO TEST IT
4484
4485  030710  052737  000014  177746  T18L02: BIS     #14,@#CCR       ;CACHE OFF
4486  030716  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF TRAP
4487  030722  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF TRAP
4488  030730  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
4489  030732  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR, A17,A16
4490  030734  000101                          .WORD   RSER
4491  030736  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
4492  030740  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
4493  030744  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
4494  030750  076600                          MED                     ;GET LOG INFORMATION
4495  030752  000102                          .WORD   LOADD
4496  030754  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
4497
4498  030760  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4499  030762  076600                          MED                     ;GET CONTENTS OF LOG REG
4500  030764  000022                          .WORD   RLOG
4501  030766  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4502  030772  076600                          MED                     ;UNLOCK ERROR LOG
4503  030774  000222                          .WORD   WLOG
4504  030776  012600                          MOV     (SP)+,R0        ;RESTORE R0
4505
4506  030000  104074                          ERROR   74              ;ERROR: DYNAMIC TEST OF CACHE FAILED
4507                                                                  ;       TRAP TO 10 OCCURRED
4508  030002  000514                          BR      T18L10          ;GO TO END OF TEST
4509
4510  030004  052737  000014  177746  T18L03: BIS     #14,@#CCR       ;CACHE OFF
4511  030012  005037  001160                  CLR     $REG1           ;SAVE ADDRESS
4512  030016  010037  001162                  MOV     R0,$REG2        ;SAVE ADDRESS
4513  030022  010337  001164                  MOV     R3,$REG3        ;SAVE BAD DATA
4514  030026  010137  001166                  MOV     R1,$REG4        ;SAVE GOOD DATA
4515  030032  104073                          ERROR   73              ;ERROR: DYNAMIC TEST OF CACHE FAILED
4516                                                                  ;       LOC HELD WRONG DATA
4517  030034  000477                          BR      T18L10          ;GO TO NEXT TEST
4518
4519  030036  052737  000014  177746  T18L01: BIS     #14,@#CCR       ;CACHE OFF
4520
4521  030044  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4522  030046  076600                          MED                     ;GET CONTENTS OF LOG REG
4523  030050  000022                          .WORD   RLOG
4524  030052  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4525  030056  076600                          MED                     ;UNLOCK ERROR LOG
4526  030060  000222                          .WORD   WLOG
4527  030062  012600                          MOV     (SP)+,R0        ;RESTORE R0
4528
4529  030064  011637  001164                  MOV     (SP),$REG3      ;GET PC+2 OF TRAP
4530  030070  162737  000002  001164          SUB     #2,$REG3        ;SAVE PC OF TRAP
4531  030076  022626                          CMP     (SP)+,(SP)+     ;ADJUST STACK
4532  030100  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR, A17,A16
4533  030102  000101                          .WORD   RSER
4534  030104  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
4535  030106  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
4536  030112  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
```



```
4537  030116  076600                          MED                     ;GET LOG INFORMATION
4538  030120  000102                          .WORD   LOADD
4539  030122  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
4540  030126  076600                          MED                     ;GET LOG INFORMATION
4541  030130  000100                          .WORD   RJAM
4542  030132  032700  000400                  BIT     #400,R0         ;ERROR IN BACKING STORE?
4543  030136  001402                          BEQ     T18L12          ;BRANCH IF NO
4544  030140  104001                          ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
4545  030142  000434                          BR      T18L10          ;GO TO NEXT TEST
4546
4547  030144  032737  000100  177744  T18L12: BIT     #100,@#EREG     ;LOW BYTE PE?
4548  030152  001406                          BEQ     T18L13          ;BRANCH IF NO
4549  030154  076600                          MED                     ;GET LOG INFORMATION
4550  030156  000106                          .WORD   CDL
4551  030160  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
4552  030164  104075                          ERROR   75              ;ERROR: DYNAMIC TEST OF CACHE FAILED
4553                                                                  ;       LOW BYTE PARITY ERROR
4554  030166  000422                          BR      T18L10          ;GO TO END OF TEST
4555
4556  030170  032737  000200  177744  T18L13: BIT     #200,@#EREG     ;HIGH BYTE PE?
4557  030176  001406                          BEQ     T18L14          ;BRANCH IF NO
4558  030200  076600                          MED                     ;GET LOG INFORMATION
4559  030202  000106                          .WORD   CDH
4560  030204  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
4561  030210  104076                          ERROR   76              ;ERROR: DYNAMIC TEST OF CACHE FAILED
4562                                                                  ;       HIGH BYTE PARITY ERROR
4563  030212  000410                          BR      T18L10          ;GO TO END OF TEST
4564
4565  030214                          T18L14:
4566  030214  076600                          MED                     ;GET TAG LOG INFO.
4567  030216  000107                          .WORD   RTAG
4568  030220  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
4569  030222  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
4570  030226  010037  001164                  MOV     R0,$REG3        ;SAVE BAD DATA
4571  030232  104077                          ERROR   77              ;ERROR: DYNAMIC TEST OF CACHE FAILED
4572                                                                  ;       TAG PARITY ERROR
4573
4574  030234  005037  177572          T18L10: CLR     @#MMR0          ;KT OFF
4575  030240  012737  000012  000010          MOV     #12,@#10        ;RESTORE TRAP CATCHER
4576  030246  005037  000012                  CLR     @#12            ;RESTORE TRAP CATCHER
4577  030252  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE HANDLER FOR PARITY ERRORS
4578
4579
4580                                  ;;*****************************************************************
4581                                  ;*TEST 37       TEST RETRIES TO BACKING STORE DONE ON CACHE PARITY TRAP
4582                                  ;*
4583                                  ;*   THE JAMUPP ON CACHE PARITY ERROR BIT IS CLEARED AND
4584                                  ;*THE CACHE CONTROL REG IS TESTED TO CONTAIN THE CORRECT
4585                                  ;*VALUE.  A CACHE LOC IS THEN WRITTEN WITH WRONG PARITY
4586                                  ;*AND A TRAP IS FORCED.  THE LOC IS THEN REFERENCED TO SEE
4587                                  ;*IF IT STILL IS IN CACHE (RETRY DONE).
4588
4589                                  ;;*****************************************************************
4590  030260  012737  000214  177746  TST37:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4591  030266  000004                          SCOPE
4592  030270  012737  030524  001234          MOV     #TST40,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
```

```
4593  030276  012737  030350  000114          MOV     #1$,@#PVEC      ;SET UP FOR PARITY TRAP
4594  030304  042737  000200  177746          BIC     #200,@#CCR      ;ENABLE RETRIES
4595  030312  032737  000200  177746          BIT     #200,@#CCR      ;WAS BIT CLEARED?
4596  030320  001045                          BNE     2$              ;BRANCH IF NO TO ERROR
4597  030322  012737  000100  177746          MOV     #100,@#CCR      ;CACHE ON, WRITE WRONG PARITY, DO RETRIES
4598  030330  005037  060000                  CLR     @#BUFL          ;WRITE WRONG PARITY
4599  030334  012737  000000  177746          MOV     #0,@#CCR        ;WWP OFF
4600  030342  005737  060000                  TST     @#BUFL          ;FORCE TRAP
4601  030346  000445                          BR      3$              ;REPORT ERROR IF NO TRAP
4602
4603  030350  062706  000004          1$:     ADD     #4,SP           ;RESTORE THE STACK
4604
4605  030354  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4606  030356  076600                          MED                     ;GET CONTENTS OF LOG REG
4607  030360  000022                          .WORD   RLOG
4608  030362  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4609  030366  076600                          MED                     ;UNLOCK ERROR LOG
4610  030370  000222                          .WORD   WLOG
4611  030372  012600                          MOV     (SP)+,R0        ;RESTORE R0
4612
4613  030374  005737  060000                  TST     @#BUFL          ;SEE IF DATA IN CACHE
4614  030400  033727  177752  000004          BIT     @#HMR,#HMR2     ;HIT?
4615  030406  001036                          BNE     T23L01          ;GO TO END OF TEST IF YES
4616  030410  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
4617
4618                                          ;RID CACHE OF BAD PARITY
4619  030416  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
4620  030424  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
4621
4622
4623  030430  104110                          ERROR   110             ;ERROR: RETRY TO BACKING STORE NOT DONE ON CACHE PARITY
4624  030432  000424                          BR      T23L01          ;GO TO END OF TEST
4625
4626  030434  013737  177746  001160  2$:     MOV     @#CCR,$REG1     ;SAVE BAD DATA
4627  030442  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF
4628  030450  012737  000014  001162          MOV     #14,$REG2       ;SAVE GOOD DATA
4629  030456  104026                          ERROR   26              ;ERROR: CACHE CONTROL REG HELD WRONG DATA
4630  030460  000411                          BR      T23L01          ;GO TO END OF TEST
4631
4632  030462  012737  000214  177746  3$:     MOV     #214,@#CCR      ;CACHE OFF
4633  030470  005037  001160                  CLR     $REG1           ;SAVE ADDR. OF TESTED LOC
4634  030474  012737  060000  001162          MOV     #BUFL,$REG2     ;SAVE ADDR. OF TESTED LOC
4635  030502  104042                          ERROR   42              ;ERROR: NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PARIT
4636
4637  030504                          T23L01:
4638
4639                                          ;RID CACHE OF BAD PARITY
4640  030504  012737  000214  177746          MOV     #214,@#CCR      ;CACHE OFF IF ON
4641  030512  004737  035134                  JSR     PC,SWEEP        ;GO PURGE CACHE
4642
4643
4644  030516  012737  033142  000114          MOV     #UPERR,@#PVEC   ;RESTORE PARITY ERROR HANDLER
4645
4646                                  ;;**************************************************************
4647                                  ;*TEST 40        TEST DATO TO I/0 LOC NOT WRITTEN IN CACHE AND I/0
4648                                  ;*
```



```
4649                                  ;*   THE TEST INSTRUCTION ADDRESSES ARE FIRST EXAMINED TO
4650                                  ;*DETERMINE IF THEY OVERLAP THE TEST LOCATION ADDRESS IN
4651                                  ;*CACHE.  IF THEY DO, THE TEST IS RUN IN A NON OVERLAPPING
4652                                  ;*ADDRESS SPACE.  A LOC IS PUT IN CACHE WHICH HAS THE SAME
4653                                  ;*11 LEAST SIGNIFICANT ADDRESS BITS AS THE MEMORY MANAGEMENT
4654                                  ;*REG KIPAR0.  A DATO IS THEN DONE TO KIPAR0 AND THE LOC
4655                                  ;*IS CHECKED TO STILL BE IN CACHE.
4656
4657                                  ;;**************************************************************
4658  030524  012737  000214  177746  TST40:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4659  030532  000004                          SCOPE
4660  030534  012737  030674  001234          MOV     #TST41,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4661  030542  012737  000200  177746          MOV     #200,@#CCR      ;TURN ON ALL OF CACHE
4662  030550  012737  030610  001172          MOV     #T19L01,@#$TMP0 ;SAVE ADDRESS OF TEST INSTRUCTION
4663  030556  042737  174000  001172          BIC     #174000,@#$TMP0 ;LOOK AT ITS CACHE ADDRESS
4664  030564  023727  001172  002326          CMP     @#$TMP0,#2326   ;INSTRUCTION AT TEST LOC?
4665  030572  002404                          BLT     T19L02          ;BRANCH IF NO
4666  030574  023727  001172  002340          CMP     @#$TMP0,#2340   ;INSTRUCTION AT TEST LOC?
4667  030602  003422                          BLE     T19L03          ;BRANCH IF YES
4668  030604  005737  002340          T19L02: TST     @#2340          ;PUT TEST LOC IN CACHE
4669  030610  005037  172340          T19L01: CLR     @#KIPAR0        ;DO DATO TO I/O
4670  030614  005737  002340                  TST     @#2340          ;DATA STILL IN CACHE
4671  030620  033727  177752  000004          BIT     @#HMR,#HMR2     ;WAS IT A HIT?
4672  030626  001022                          BNE     TST41           ;;GO TO NEXT TEST IF YES
4673  030630  012737  000003  001160  T19L04: MOV     #3,$REG1        ;SAVE PHYSICAL ADDRESS HIGH
4674  030636  012737  172340  001162          MOV     #172340,$REG2   ;SAVE PHYSICAL ADDRESS LOW
4675  030644  104025                          ERROR   25              ;ERROR: DATO TO I/O ADDRESS WRITTEN IN CACHE
4676  030646  000412                          BR      TST41           ;;GO TO NEXT TEST
4677
4678  030650  005737  002340          T19L03: TST     @#2340          ;PUT TEST LOC IN CACHE
4679  030654  005037  172340                  CLR     @#KIPAR0        ;DO DATO TO I/O
4680  030660  005737  002340                  TST     @#2340          ;DATA STILL IN CACHE?
4681  030664  033727  177752  000004          BIT     @#HMR,#HMR2     ;STILL A HIT?
4682  030672  001756                          BEQ     T19L04          ;BRANCH TO ERROR IF NO
4683
4684                                  ;;**************************************************************
4685                                  ;*TEST 41        TEST CONSOLE INITIATED SWEEP INVALIDATES ALL CACHE
4686                                  ;*
4687                                  ;*   A LOC IS PUT IN CACHE, CHECKED TO BE A HIT AND THEN
4688                                  ;*A CONSOLE SWEEP IS INITIATED.  THE LOC IS AGAIN REF-
4689                                  ;*ERENCED TO SEE IF IT WAS INVALIDATED (NOT A HIT).  THIS
4690                                  ;*IS DONE FOR ALL OF CACHE.  BEFORE THE CONSOLE SWEEP IS
4691                                  ;*STARTED, THE TEST LOC IS VERIFIED TO NOT OVERLAP THE
4692                                  ;*PROGRAM INSTRUCTION ADDRESSES IN CACHE.  IF THEY DO, THE
4693                                  ;*TEST IS RUN OUT OF A DIFFERENT ADDRESS SPACE.
4694                                  ;*   R0 CONTAINS THE ADDRESS UNDER TEST.
4695
4696                                  ;;**************************************************************
4697  030674  012737  000214  177746  TST41:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4698  030702  000004                          SCOPE
4699  030704  012737  031132  001234          MOV     #TST42,SKTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4700  030712  012737  000200  177746          MOV     #200,@#CCR      ;CACHE ON
4701  030720  012702  060000                  MOV     #BUFL,R2        ;INIT REG FOR TEST ADDRESS
4702  030724  012701  002000                  MOV     #2000,R1        ;INIT LOOP COUNT
4703
4704                                          ;DOES THE TEST ADDR OVERLAP THE SAME ADDR SPACE IN CACHE AS THE PROGRAM INSTRUCT
```

```
                                                
030730  010237  001172        T25L04: MOV     R2,$TMP0        ;GET TEST ADDR.
030734  012737  031006  001174        MOV     #1$,$TMP1       ;GET PROGRAM TEST INSTRUCTION ADDR.
030742  042737  174000  001172        BIC     #174000,$TMP0   ;CALC ADDRESSES CORRESP. CACHE ADDR
030750  042737  174000  001174        BIC     #174000,$TMP1   ;CALC ADDRESSES CORRESP. CACHE ADDR
030756  023737  001174  001172        CMP     $TMP1,$TMP0     ;DO THE CACHE ADDRESSES OVERLAP?
030764  101010                      BHI     1$              ;BRANCH IF NO
030766  062737  000012  001174        ADD     #12,$TMP1       ;CALC LAST PROG. TEST INSTRUCTION ADDR
030774  023737  001172  001174        CMP     $TMP0,$TMP1     ;DO THE CACHE ADDRESSES OVERLAP?
031002  101415                      BLOS    T25L01          ;BRANCH IF YES

031004  005012                      CLR     (R2)            ;PUT THE DATA IN CACHE
031006                          1$:
031006  012700  000200              MOV     #200,R0         ;SET BIT IN R0 FOR CONSOLE CACHE SWEEP
031012  076600                      MED                     ;CONSOLE CACHE SWEEP
031014  000352                      .WORD   WINIT
031016  005712                      TST     (R2)            ;SEE IF LOC STILL IN CACHE
031020  033727  177752  000004        BIT     @#HMR,#HMR2     ;HIT?
031026  001016                      BNE     T25L02          ;BRANCH TO ERROR IF YES
031030  005722                  T25L03: TST     (R2)+           ;UPDATE ADDRESS
031032  077142                      SOB     R1,T25L04       ;BRANCH IF ALL CACHE NOT TESTED
031034  000436                      BR      TST42           ;;GO TO NEXT TEST

031036  005012                  T25L01: CLR     (R2)            ;PUT DATA IN CACHE
031040  012700  000200              MOV     #200,R0         ;SET BIT IN R0 FOR CONSOLE CACHE SWEEP
031044  076600                      MED                     ;CONSOLE CACHE SWEEP
031046  000352                      .WORD   WINIT
031050  005712                      TST     (R2)            ;SEE IF LOC STILL IN CACHE
031052  033727  177752  000004        BIT     @#HMR,#HMR2     ;HIT?
031060  001001                      BNE     T25L02          ;BRANCH TO ERROR IF YES
031062  000762                      BR      T25L03          ;LOOK AT NEXT ADDRESS

031064  052737  000014  177746  T25L02: BIS     #14,@#CCR       ;CACHE OFF
031072  005037  001160              CLR     $REG1           ;SAVE FAILING ADDRESS
031076  010237  001162              MOV     R2,$REG2        ;SAVE FAILING ADDRESS
031102  012737  030730  001110        MOV     #T25L04,@#$LPERR  ;INIT RETURN FOR ERROR LOOP
031110  104113                      ERROR   113             ;ERROR: ADDR. NOT INVALIDATED BY CONSOLE SWEEP
031112  123727  001103  000003        CMPB    @#$ERFLG,#3     ;MORE THAN 3 ERRORS?
031120  101004                      BHI     TST42           ;;GO TO NEXT TEST IF YES
031122  012737  000200  177746        MOV     #200,@#CCR      ;CACHE ON
031130  000737                      BR      T25L03          ;CONTINUE TEST

                                ;;**************************************************************
                                ;*TEST 42        TEST POWER UP INVALIDATES CACHE AND CLEARS CACHE CONTROL REG
                                ;*
                                ;*   THIS TEST IS ONLY RUN IF SW07=1.  THIS IS BECAUSE
                                ;*OPERATOR INTERVENTION IS NEEDED TO POWER DOWN AND THEN
                                ;*UP THE MACHINE WHEN THE MESSAGE IS TYPED ON THE TTY.
                                ;*IF RUNNING UNDER APT AND SW07=1,THE PROGRAM ASSUMES
                                ;*THAT A UNIBUS EXERCISOR (M7855) IS AVAILABLE
                                ;*TO POWER DOWN AND THEN UP THE MACHINE.
                                ;*AFTER THE MACHINE HAS DONE THIS, THE CACHE CONTROL REG
                                ;*IS EXAMINED TO HAVE BEEN PROPERLY INITIALIZED BY POWER
                                ;*UP.  AFTER THIS ALL CACHE IS REFERENCED.  THERE IS A
                                ;*VERY HIGH PROBABILITY THAT CACHE WILL HAVE PARITY ERRORS
                                ;*IF THE POWER UP FAILED TO SWEEP CACHE.  ANY CACHE PARITY
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                                ;*ERROR THEREFORE IS REPORTED AS THE POWER UP FAILING TO
                                ;*INVALIDATE CACHE.IT SHOULD BE POINTED OUT THAT
                                ;*THE SWEEP MECHANISM IS CHECKED IN THE PREVIOUS TEST.THIS
                                ;*TEST VERIFIES THAT THE MECHANISM CAN BE INITIATED BY
                                ;*THE POWER UP SEQUENCE.
                                ;*
                                ;*NOTE:IF MACHINE HAS VOLATILE MEMORY, THE SWITCH
                                ;*      SETTINGS WILL HAVE TO BE RESTORED AFTER THIS TEST


                                ;;**************************************************************
031132  012737  000214  177746  TST42:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
031140  000004                      SCOPE
031142  012737  031524  001234        MOV     #TST43,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
031150  032777  000200  147756        BIT     #SW07,@SWR      ;RUN THIS TEST?
031156  001562                      BEQ     TST43           ;;BRANCH TO NEXT TEST IF NO
031160  012737  031412  000114        MOV     #T20L01,@#PVEC  ;SET UP FOR PARITY ERRORS
031166  012737  031226  000024        MOV     #T20L02,@#PWRVEC ;SET UP FOR POWER DOWN
031174  012737  000314  177746        MOV     #314,@#CCR      ;SET ALL BITS IN CCR
031202  105737  001256              TSTB    @#$ENV          ;RUNNING UNDER APT?
031206  001404                      BEQ     1$              ;BRANCH IF NO
031210  012777  000020  147776        MOV     #20,@CREG2      ;SET UP UBE TO POWER FAIL
031216  000777                      BR      .               ;WAIT FOR POWER FAIL

031220  104401  040625          1$:     TYPE    ,MSG2           ;POWER DOWN AND THEN UP
031224  000777                      BR      .               ;WAIT FOR POWER DOWN

031226  012737  031246  000024  T20L02: MOV     #T20L03,@#PWRVEC ;SET UP FOR POWER UP
031234  022626                      CMP     (SP)+,(SP)+     ;RESTORE STACK
031236  017737  147672  001172        MOV     @SWR,$TMP0      ;SAVE (SWR)
031244  000777                      BR      .               ;WAIT FOR POWER UP

031246  012706  001100          T20L03: MOV     #STACK,SP       ;RESTORE STACK
031252  105737  001256              TSTB    @#$ENV          ;RUNNING UNDER APT?
031256  001402                      BEQ     1$              ;BRANCH IF NO
031260  005077  147730              CLR     @CREG2          ;STOP UBE POWER FAIL

031264  013703  001172          1$:     MOV     $TMP0,R0        ;GET (SWR)
031270  076600                      MED                     ;RESTORE SWR
031272  000226                      .WORD   WSW
031274  012701  177000              MOV     # 177000,R1             ;INIT DELAY
031300  012700  177400          3$:     MOV     #177400,R0      ;INIT DELAY COUNTER FOR TTY
031304  063737  060000  060000  2$:     ADD     @#BUFL,@#BUFL   ;DELAY
031312  005200                      INC     R0
031314  001373                      BNE     2$              ;WAIT FOR TTY
031316  005201                      INC     R1
031320  001367                      BNE     3$              ;CONTINUE DELAY
031322  013737  177746  001160        MOV     @#CCR,$REG1     ;SEE IF CCR INITIALIZED
031330  001401                      BEQ     T20L04          ;BRANCH IF CCR CLEARED
031332  104101                      ERROR   101             ;ERROR: CACHE CONTROL REG NOT INIT BY POWER FAIL

031334                          T20L04:

031334  010046                      MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
031336  076600                      MED                     ;GET CONTENTS OF LOG REG
031340  000022                      .WORD   RLOG
```

```
4817  031342  052700  100001          BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4818  031346  076600                  MED                     ;UNLOCK ERROR LOG
4819  031350  000222                  .WORD   WLOG
4820  031352  012600                  MOV     (SP)+,R0        ;RESTORE R0
4821
4822  031354  012737  000200  177746  MOV     #200,@#CCR      ;JAMUPP ON PARITY ERRORS
4823  031362  012701  002000          MOV     #2000,R1        ;INIT LOOP COUNT
4824  031366  005000                  CLR     R0              ;INIT ADDRESS
4825  031370  005720          1$:     TST     (R0)+           ;REFERENCE ALL CACHE LOC
4826  031372  077102                  SOB     R1,1$           ;LOOP TILL DONE
4827  031374  012737  033142  000114  T20L06: MOV    #UPERR,@#PVEC   ;RESTORE PARITY ERROR HANDLER
4828  031402  012737  040364  000024  MOV     #@PWRDN,@#PWRVEC ;RESTORE POWER FAIL HANDLER
4829  031410  000445                  BR      TST43           ;;GO TO NEXT TEST
4830
4831  031412  052737  000014  177746  T20L01: BIS    #14,@#CCR       ;CACHE OFF TO STOP FURTHER PARITY ERRORS
4832
4833  031420  010046                  MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
4834  031422  076600                  MED                     ;GET CONTENTS OF LOG REG
4835  031424  000022                  .WORD   RLOG
4836  031426  052700  100001          BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
4837  031432  076600                  MED                     ;UNLOCK ERROR LOG
4838  031434  000222                  .WORD   WLOG
4839  031436  012600                  MOV     (SP)+,R0        ;RESTORE R0
4840
4841  031440  011637  001164          MOV     (SP),$REG3      ;GET PC+2 OF ERROR
4842  031444  162737  000002  001164  SUB     #2,$REG3        ;SAVE PC OF ERROR
4843  031452  022626                  CMP     (SP)+,(SP)+     ;RESTORE STACK
4844  031454  076600                  MED                     ;GET LOG INFORMATION
4845  031456  000100                  .WORD   RJAM
4846  031460  032700  000400          BIT     #400,R0         ;ERROR IN BACKING STORE?
4847  031464  001415                  BEQ     T20L05          ;BRANCH IF NO
4848  031466  076600                  MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
4849  031470  000101                  .WORD   RSER
4850  031472  000300                  SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
4851  031474  042700  177776          BIC     #177776,R0      ;ONLY LOOK AT A17, A16
4852  031500  010037  001160          MOV     R0,$REG1        ;SAVE ADDRESS
4853  031504  076600                  MED                     ;GET LOG INFORMATION
4854  031506  000102                  .WORD   LOADD
4855  031510  010037  001162          MOV     R0,$REG2        ;SAVE INFORMATION
4856  031514  104001                  ERROR   1               ;UNEXPECTED PARITY ERROR IN BACKING STORE
4857  031516  000726                  BR      T20L06          ;GO TO NEXT TEST
4858
4859  031520  104102          T20L05: ERROR   102             ;ERROR: POWER UP FAILED TO INVALIDATE CACHE
4860  031522  000724                  BR      T20L06          ;GO TO NEXT TEST
4861
4862
4863                                  ;;**************************************************************
4864
4865
4866                                  ;THE FOLLOWING TESTS ARE RUN ONLY IF SW08=1 AT THE
4867                                  ;BEGINNING OF THE PROGRAM.  AND THE NPR DEVICE WAS SELECTED.
4868                                  ;THESE TESTS USE DATA SUPPLIED BY THE USER WHEN THE PROGRAM
4869                                  ;IS STARTED TO SETUP VARIOUS CONTROL REGISTERS TO RUN THE
4870                                  ;NPR DEVICE.  CREG1 ALWAYS CONTAINS THE DEVICES GO ADDRESS,
4871                                  ;EAD CONTAINS THE DEVICES ERROR REG ADDRESS, IVEC CONTAINS
4872                                  ;THE DEVICE'S INTERRUPT VECTOR (IF USED), SETUP CONTAINS THE
```



```
4873                                  ;ADDRESS OF THE DEVICE'S HANDLER AND THE REMAINING CREG2-5
4874                                  ;CONTAIN VARIOUS CONTROL INFORMATION NEEDED FOR THE PARTICULAR
4875                                  ;DEVICE USED.  THE SETUP HANDLERS ARE USED TO INITIALIZE THE
4876                                  ;DEVICE TO DO NPR DATOS TO THE STARTING ADDRESS FOLLOWING
4877                                  ;THE SUBROUTINE CALL.
4878
4879                                  ;;**************************************************************
4880
4881
4882                                  ;;**************************************************************
4883                                  ;*TEST 43        TEST NPR DATO INVALIDATES CACHE FOR PHYSICAL ADDRESS BITS A1-A10
4884                                  ;*
4885                                  ;*    THIS TEST IS ONLY RUN IF SW08=1.  THE PREVIOUSLY SEL-
4886                                  ;*ECTED DEVICE IS SETUP TO DO NPR DATO'S TO ADDRESSES IN
4887                                  ;*A 1K BUFFER AREA.  ON THE FIRST PASS A '1' IS FLOATED
4888                                  ;*THROUGH THE ADDRESS LINES A1-A10.  AT EACH BIT POSITION,
4889                                  ;*THE LOC IS PUT IN CACHE AND THEN A NPR DATO IS DONE TO
4890                                  ;*THAT LOC.  A MINIMUM TIME IS THEN WAITED TO ALLOW THE
4891                                  ;*SLOWEST DEVICE SELECTABLE TO FINISH ITS TRANSFERS.  THE
4892                                  ;*LOC IS THEN CHECKED TO BE A MISS.
4893                                  ;*    FOR THE SECOND PASS, A '0' IS FLOATED THROUGH ADDRESS
4894                                  ;*BITS A1-A10 AND THE SAME PROCEDURE IS REPEATED.  BEFORE
4895                                  ;*THE DEVICE'S GO BIT IS SET, THE TRANSFER ADDRESS IS CHECKED
4896                                  ;*TO SEE IF IT OVERLAPS THE INSTRUCTION ADDRESS IN CACHE.
4897                                  ;*IF IT DOES, THE INSTRUCTIONS ARE EXECUTED OUT OF A NON
4898                                  ;*OVERLAPPING ADDRESS SPACE.
4899                                  ;*    R0  CONTAINS THE DEVICES GO ADDRESS
4900                                  ;*    R1  CONTAINS THE PASS INDICATOR
4901                                  ;*    R2  IS THE DELAY COUNTER
4902                                  ;*    R3  CONTAINS THE TRANSFER ADDRESS
4903                                  ;*    R4  USED TO CALCULATE NEXT TRANSFER ADDRESS
4904
4905                                  ;;**************************************************************
4906  031524  012737  000214  177746  TST43:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
4907  031532  000004                  SCOPE
4908  031534  012737  032240  001234  MOV     #TST44,$KTST    ;SAVE POINTER TO NEXT TEST IF UNEXPECTED PARITY ERROR
4909  031542  032777  000400  147364  BIT     #SW08,@SWR      ;NPR DEVICE AVAILABLE?
4910  031550  001002                  BNE     1$              ;BRANCH IF YES
4911  031552  000137  032240          JMP     @#TST44         ;NO GO TO NEXT TEST
4912  031556  012737  000200  177746  1$:     MOV     #200,@#CCR      ;CACHE ON
4913  031564  004737  034000          JSR     PC,VEC          ;SEE IF UBE NEW USED AND SETUP INTERRUPT VECTOR
4914  031570  013700  001212          MOV     CREG1,R0        ;GET DEVICE'S GO ADDRESS
4915  031574  005001                  CLR     R1              ;CLEAR FLAG FOR PASS 1 (FLOAT 1 PATTERN)
4916  031576  012704  000002          MOV     #2,R4           ;INIT REG FOR ADDR. CALC.
4917  031602  012737  060002  031620  MOV     #BUFL+2,@#ADD1L ;INIT ADDRESS LOWER FOR TEST
4918  031610  005037  031622          CLR     @#ADD1H         ;INIT ADDRESS HIGHER FOR TEST
4919  031614  004777  147412  T21L09: JSR     PC,@SETUP       ;SETUP DEVICE TO DO NPR DATO TO FOLLOWING ADDRESS
4920  031620  000000          ADD1L:  .WORD   0               ;TEST ADDRESS LOWER 16 BITS
4921  031622  000000          ADD1H:  .WORD   0               ;TEST ADDRESS UPPER 2 BITS
4922  031624  005002                  CLR     R2              ;INIT R2 FOR TIME DELAY COUNT
4923
4924                                  ;FIND OUT IF THE TEST INSTRUCTION ADDRESS IN CACHE
4925                                  ;OVERLAP THE XFER ADDRESS IN CACHE.  IF THEY DO, USE THE
4926                                  ;TEST INSTRUCTIONS AT NON OVERLAPPING ADDRESS.  THIS IS TO
4927                                  ;ENSURE THAT A MISS IS DUE TO A INVALIDATE RATHER THAN
4928                                  ;THE TEST INSTRUCTION SWAPPING OUT OF CACHE THE XFER LOCATION.
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```
4929
4930  031626  013737  031620  001172          MOV     ADD1L,@TMP0     ;GET XFER ADDRESS
4931  031634  042737  174000  001172          BIC     #174000,@TMP0   ;CALC ITS CACHE ADDRESS
4932  031642  012737  031712  001174          MOV     #T21L01,@TMP1   ;GET TEST INST ADDRESS
4933  031650  042737  174000  001174          BIC     #174000,@TMP1   ;CALC ITS CACHE ADDRESS
4934  031656  023737  001172  001174          CMP     @TMP0,@TMP1     ;DOES XFER ADDRESS OVERLAP TEST INST?
4935  031664  002407                          BLT     T21L02          ;BRANCH IF NO
4936  031666  062737  000022  001174          ADD     #22,@TMP1       ;GET ADDRESS OF LAST OVERLAPPING TEST INST.
4937  031674  023737  001172  001174          CMP     @TMP0,@TMP1     ;DOES XFER ADDRESS STILL OVERLAP TEST INST?
4938  031702  003503                          BLE     T21L03          ;BRANCH IF YES TO TEST INST. AT DIFFERENT CACHE ADDRESS
4939  031704  013703  031620          T21L02: MOV     ADD1L,R3        ;GET XFER ADDRESS
4940  031710  021313                          CMP     (R3),(R3)       ;MAKE XFER ADDRESS A HIT
4941  031712  033727  177752  000004  T21L01: BIT     @#HMR,@#HMR2    ;MAKE SURE ITS IN CACHE
4942  031720  001514                          BEQ     T21L04          ;BRANCH IF NO TO ERROR
4943  031722  005210                          INC     (R0)            ;SET DEVICES GO BIT TO START DATA XFERS
4944  031724  005202                  1$:     INC     R2              ;DELAY TILL THE SLOWEST DEVICE
4945  031726  001376                          BNE     1$              ;HAS FINISHED ITS XFERS
4946  031730  005713                          TST     (R3)            ;SEE IF NPR DATO HAS INVALIDATED THE XFER ADDRESS IN CAC
4947  031732  033727  177752  000004          BIT     @#HMR,@#HMR2    ;LOC NOW A MISS? (CACHE INVALIDATED?)
4948  031740  001117                          BNE     T21L05          ;GO REPORT ERROR IF LOC A HIT
4949  031742  005777  147262          T21L11: TST     @EAD            ;SEE IF DEVICE HAD AN ERROR
4950  031746  100514                          BMI     T21L05          ;REPORT DEVICE ERROR IF YES
4951  031750  005701                          TST     R1              ;PASS 1?
4952  031752  001024                          BNE     T21L07          ;BRANCH IF NO
4953  031754  032704  002000                  BIT     #2000,R4        ;LAST FLOAT 1 PATTERN USED?
4954  031760  001007                          BNE     T21L08          ;BRANCH IF YES
4955  031762  006304                          ASL     R4              ;GENERATE NEXT FLOAT 1 PATTERN
4956  031764  010437  031620                  MOV     R4,ADD1L        ;SAVE ITS LOWER BITS
4957  031770  052737  060000  031620          BIS     #BUFL,ADD1L     ;SET ITS HIGH BITS SO ITS IN TEST BUFFER
4958  031776  000706                          BR      T21L09          ;GO TEST IT
4959
4960  032000  052701  000001          T21L08: BIS     #1,R1           ;SET FLAG FOR PASS 2 TO INDICATE FLOAT 0 PATTERN
4961  032004  012704  001776                  MOV     #1776,R4        ;INIT REG FOR TEST ADDR. CALC.
4962  032010  010437  031620                  MOV     R4,ADD1L        ;SAVE LOWER TEST ADDR.
4963  032014  052737  060000  031620          BIS     #BUFL,ADD1L     ;MAKE SURE ADDR. IN TEST AREA
4964  032022  000674                          BR      T21L09          ;GO TEST IT
4965
4966  032024  022704  003776          T21L07: CMP     #3776,R4        ;AT LAST FLOAT 0 PATTERN?
4967  032030  001413                          BEQ     T21L10          ;BRANCH IF YES TO END OF TEST
4968  032032  006204                          ASR     R4              ;GENERATE NEW TEST ADDR.
4969  032034  052704  002000                  BIS     #2000,R4        ;MAKE IT A FLOAT 0 PATTERN
4970  032040  042704  000001                  BIC     #1,R4           ;MAKE IT A WORD ADDR.
4971  032044  010437  031620                  MOV     R4,ADD1L        ;SAVE LOWER TEST ADDR.
4972  032050  052737  060000  031620          BIS     #BUFL,ADD1L     ;MAKE SURE ADDRESS IS IN TEST BUFFER
4973  032056  000656                          BR      T21L09          ;GO TEST IT
4974
4975  032060  022737  034046  001232  T21L10: CMP     #HUBEN,SETUP    ;NEW UNIBUS EXERCISOR USED?
4976  032066  001064                          BNE     TST44           ;;BRANCH TO NEXT TEST IF NO
4977  032070  013737  001226  001172          MOV     IVEC,@TMP0      ;GET UBE INTERRUPT VECTOR
4978  032076  062737  000002  001172          ADD     #2,@TMP0        ;AND RESTORE
4979  032104  005077  147062                  CLR     @#TMP0          ;THE TRAP CATCHER
4980  032110  000453                          BR      TST44           ;;GO TO NEXT TEST
4981
4982                                          ;TEST INST TO TEST XFER ADDRESSES WHICH OVERLAP TEST CODE
4983
4984  032112  013703  031620          T21L03: MOV     ADD1L,R3        ;GET XFER ADDRESS
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4985  032116  021313                          CMP     (R3),(R3)       ;MAKE ADDRESS A HIT
4986  032120  033727  177752  000004          BIT     @#HMR,@#HMR2    ;MAKE SURE ITS IN CACHE
4987  032126  001411                          BEQ     T21L04          ;BRANCH IF NO TO ERROR
4988  032130  005210                          INC     (R0)            ;SET DEVICES GO BIT TO START DATA XFER
4989  032132  005202                  1$:     INC     R2              ;DELAY TILL THE SLOWEST DEVICE
4990  032134  001376                          BNE     1$              ;HAS FUNISHED ITS XFERS.
4991  032136  005713                          TST     (R3)            ;SEE IF NPR DATO HAS INVALIDATED XFER ADDR. IN CACHE
4992  032140  033727  177752  000004          BIT     @#HMR,@#HMR2    ;IS LOC NOW A MISS? (CACHE INVALIDATED?)
4993  032146  001014                          BNE     T21L05          ;GO REPORT ERROR IF LOC A HIT
4994  032150  000674                          BR      T21L11          ;CHECK FOR DEVICE ERROR
4995
4996  032152  012737  031614  001110  T21L04: MOV     #T21L09,@#LPERR ;SET UP RETURN FOR ERROR LOOP
4997  032160  013737  031622  001160          MOV     ADD1H,@REG1     ;SAVE 'BAD' ADDRESS
4998  032166  013737  031620  001162          MOV     ADD1L,@REG2     ;SAVE 'BAD' ADDRESS
4999  032174  104043                          ERROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
5000  032176  000730                          BR      T21L10          ;GO TO END OF TEST
5001
5002  032200  012737  031614  001110  T21L05: MOV     #T21L09,@#LPERR ;SET UP RETURN FOR ERROR LOOP
5003  032206  013737  031622  001160          MOV     ADD1H,@REG1     ;SAVE BAD ADDRESS
5004  032214  013737  031620  001162          MOV     ADD1L,@REG2     ;SAVE BAD ADDRESS
5005  032222  005777  147002                  TST     @EAD            ;DID DEVICE HAVE ERROR?
5006  032226  100002                          BPL     1$              ;BRANCH IF NO
5007  032230  104103                          ERROR   103             ;ERROR: DEVICE ERROR BIT SET WHEN DOING DATO TO ADDRESS
5008  032232  000712                          BR      T21L10          ;GO TO END OF TEST
5009  032234  104104                  1$:     ERROR   104             ;ERROR: CACHE LOC NOT INVALIEDATED BY NPR DATO TO ADDR.
5010  032236  000710                          BR      T21L10          ;GO TO END OF TEST.
5011
5012                                          ;;*****************************************************************
5013                                          ;*TEST 44        TEST NPR DATO INVALIDATES CACHE FOR PHYSICAL ADDRESS BITS A17-A11
5014                                          ;*
5015                                          ;*    THIS TEST IS RUN ONLY IF SW08=1 AND THE INHIBIT TESTS
5016                                          ;*USING KT (SW12)=0.  THE PREVIOUSLY SELECTED DEVICE IS
5017                                          ;*SETUP TO DO NPR DATOS TO LOCATIONS LYING OUTISDE THE
5018                                          ;*PROGRAM AND MONITOR ADDRESS SPACE.  (THE MONITOR, IF IT
5019                                          ;*EXISTS, LIES IN THE LAST 1.5K OF MEMORY).
5020                                          ;*    MEMORY IS FIRST SIZED TO DETERMINE THE MAXIMUM TESTABLE
5021                                          ;*ADDRESS,A VIRTUAL  ADDRESS IS GENERATED AND STORED IN KIPAR4.
5022                                          ;*THEN ITS PHYSICAL ADDRESS IS CALCULATED FOR THE DEVICES
5023                                          ;*NPR TRANSFER.  THE ADDRESS IS MADE A HIT IN CACHE AND THEN
5024                                          ;*AN NPR DATO IS DONE TO IT.  A MIMIMUM TIME IS THEN WAITED
5025                                          ;*TO ALLOW THE SLOWEST SELECTABLE DEVICE TO FINISH ITS
5026                                          ;*TRANSFERS.  THE LOCATION IS THEN CHECKED TO BE A MISS
5027                                          ;*(INVALIDATED).  A NEW TAG VALUE IS THEN GENERATED AND
5028                                          ;*THE PROCEDURE REPEATS TO THE MAXIMUM ALLOWABLE ADDRESS.
5029                                          ;*    BEFORE THE DEVICE'S GO BIT IS SET, THE ADDRESS IS
5030                                          ;*CHECKED TO SEE IF IT OVERLAPS THE INSTRUCTION ADDRESSES
5031                                          ;*IN CACHE.  IF IT DOES, THE INSTRUCTIONS ARE EXECUTED
5032                                          ;*OUT OF  NON OVERLAPPING ADDRESSES.
5033                                          ;*
5034                                          ;*    R0  CONTAINS THE DEVICE'S GO ADDRESS
5035                                          ;*    R2  IS THE DELAY COUNTER
5036                                          ;*    R3  IS USED TO GENERATE THE TEST ADDRESS
5037
5038                                          ;;*****************************************************************
5039  032240  012737  000214  177746  TST44:  MOV     #214,@#CCR      ;CACHE OFF FOR SCOPE
5040  032246  000004                          SCOPE
```

```
5041  032250  012737  033020  001234          MOV     #$EOP,$KTST
5042  032256  032777  000400  146650          BIT     #SW08,@SWR      ;NPR DEVICE AVAILABLE?
5043  032264  001002                          BNE     1$              ;BRANCH IF YES
5044  032266  000137  033020                  JMP     @#$EOP
5045  032272  032777  010000  146634  1$:     BIT     #SW12,@SWR      ;INHIBIT TESTS USING KT?
5046  032300  001402                          BEQ     2$              ;BRANCH IF NO
5047  032302  000137  033020                  JMP     @#$EOP
5048  032306  012737  000200  177746  2$:     MOV     #200,@#CCR      ;CACHE ON
5049  032314  052737  000200  036034          BIS     #200,@#$KT11    ;USE KT FOR $SIZE
5050  032322  004737  035750                  JSR     PC,$SIZE        ;SIZE MEM
5051  032326  162737  000040  036322          SUB     #40,$LSTBK      ;REDUCE TESTABLE MEM BY 1K SO DON'T KILL MONITOR IF EXIS
5052  032334  013700  001212                  MOV     CREG1,R0        ;GET THE GO ADDRESS OF THE DEVICE
5053  032340  005237  177572                  INC     @#MMR0          ;TURN KT ON
5054
5055                                          ;CALC TEST ADDR
5056
5057  032344  012703  000020                  MOV     #20,R3          ;INIT ADDR REG
5058  032350  006303                  T22L08: ASL     R3              ;CALC NEXT ADDR
5059  032352  010337  172350                  MOV     R3,@#KIPAR4     ;SETUP PAR WITH TEST ADDR
5060  032356  023727  172350  001000          CMP     @#KIPAR4,#1000  ;PAST INSTRUCTION SPACE?
5061  032364  002003                          BGE     1$              ;BRANCH IF YES
5062  032366  052737  000600  172350          BIS     #600,@#KIPAR4   ;MAKE SURE TEST ADDR. LIES OUTSIDE OF TEST CODE
5063  032374  023737  172350  036322  1$:     CMP     @#KIPAR4,$LSTBK ;IS TEST ADDRESS IN MONITOR ADDRESS SPACE?
5064  032402  003164                          BGT     T22L02          ;BRANCH IF YES TO END OF TEST
5065  032404  004737  034000                  JSR     PC,VEC          ;SET UP UBE NEW INT. VECT IF IT IS USED
5066
5067                                          ;CALC THE PHYSICAL ADDRESS FROM THE VIRTUAL TEST ADDRESS
5068
5069  032410  012737  101776  001172          MOV     #101776,$TMP0   ;GET VIRTUAL ADDRESS
5070  032416  004737  033434                  JSR     PC,VIP          ;CALC ITS PHYSICAL ADDRESS
5071  032422  013737  001160  032444          MOV     $REG1,ADD2H     ;SAVE PHYSICAL TEST ADDRESS
5072  032430  013737  001162  032442          MOV     $REG2,ADD2L     ;SAVE PHYSICAL TEST ADDRESS
5073  032436  004777  146570          T22L11: JSR     PC,@SETUP       ;SETUP NPR DEVICE TO DO DATO TO FOLLOWING ADDRESS
5074  032442  000000                  ADD2L:  .WORD   0               ;TEST ADDRESS LOWER 16 BITS
5075  032444  000000                  ADD2H:  .WORD   0               ;TEST ADDRESS UPPER 2 BITS
5076  032446  005002                          CLR     R2              ;INIT REG FOR TIME DELAY
5077
5078                                          ;FIND OUT IF THE TEST INSTRUCTION ADDRESS IN CACHE
5079                                          ;OVERLAP THE XFER ADDRESS IN CACHE.  IF THEY DO, USE
5080                                          ;TEST INSTRUCTIONS AT NON OVERLAPPING ADDRESS.  THIS IS TO
5081                                          ;ENSURE THAT A MISS IS DUE TO A INVALIDATE RATHER THAN
5082                                          ;THE TEST INSTRUCTION SWAPPING OUT OF CACHE THE XFER LOCATION.
5083
5084  032450  013737  032442  001172          MOV     ADD2L,$TMP0     ;GET XFER ADDRESS
5085  032456  042737  174000  001172          BIC     #174000,$TMP0   ;CALC ITS CACHE ADDRESS
5086  032464  012737  032534  001174          MOV     #T22L01,$TMP1   ;GET TEST INST ADDRESS
5087  032472  042737  174000  001174          BIC     #174000,$TMP1   ;CALC ITS CACHE ADDRESS
5088  032500  023737  001172  001174          CMP     $TMP0,$TMP1     ;DOES XFER ADDRESS OVERLAP TEST INST?
5089  032506  002407                          BLT     T22L03          ;BRANCH IF NO
5090  032510  062737  000024  001174          ADD     #24,$TMP1       ;CALC ADDR OF LAST OVERLAPPING TEST INST.
5091  032516  023737  001172  001174          CMP     $TMP0,$TMP1     ;DOES XFER ADDR STILL OVERLAP TEST INST?
5092  032524  003440                          BLE     T22L04          ;BRANCH IF YES
5093
5094  032526  023737  101776  101776  T22L03: CMP     @#101776,@#101776  ;MAKE ADDR A HIT
5095  032534  033727  177752  000004  T22L01: BIT     @#HMR,#HMR2     ;MAKE SURE ITS IN CACHE
5096  032542  001452                          BEQ     T22L05          ;BRANCH IF NO TO ERROR
```



```
5097  032544  005210                          INC     (R0)            ;SET DEVICE'S GO BIT TO DO DATA XFERS
5098  032546  005202                  1$:     INC     R2              ;DELAY TILL THE SLOWEST DEVICE
5099  032550  001376                          BNE     1$              ;HAS FINISHED ITS XFERS
5100  032552  005737  101776                  TST     @#101776        ;SEE IF NPR DATO HAS INVALIDATED THE XFER ADDR IN CACHE
5101  032556  033727  177752  000004          BIT     @#HMR,#HMR2     ;LOC NOW A MISS? (CACHE INVALIDATED?)
5102  032564  001054                          BNE     T22L06          ;GO REPORT ERROR IF LOC A HIT
5103  032566  005777  146436          T22L10: TST     @EAD            ;SEE IF DEVICE HAS AN ERROR
5104  032572  100451                          BMI     T22L06          ;REPORT DEVICE ERROR IF YES
5105  032574  023727  172350  004000          CMP     @#KIPAR4,#4000  ;TESTED LAST ADDRESS?
5106  032602  001464                          BEQ     T22L02          ;BRANCH TO END OF TEST IF YES
5107  032604  022737  034174  001232          CMP     #HUBEO,SETUP    ;WAS THE OLD UBE USED?
5108  032612  001256                          BNE     T22L08          ;NO, GO CALC NEXT TEST ADDR
5109  032614  023727  172350  001000          CMP     @#KIPAR4,#1000  ;AT LAST TESTABLE ADDRESS FOR OLD UBE?
5110  032622  002652                          BLT     T22L08          ;BRANCH IF NO
5111  032624  000453                          BR      T22L02          ;GO TO END OF TEST
5112
5113  032626  033737  101776  101776  T22L04: CMP     @#101776,@#101776  ;MAKE XFER ADDRESS A HIT
5114  032634  033727  177752  000004          BIT     @#HMR,#HMR2     ;MAKE SURE ITS IN CACHE
5115  032642  001412                          BEQ     T22L05          ;BRANCH TO ERROR IF NO
5116  032644  005210                          INC     (R0)            ;SET DEVICES TO BIT TO DO XFERS.
5117  032646  005202                  1$:     INC     R2              ;DELAY TILL THE SLOWEST DEVICE
5118  032650  001376                          BNE     1$              ;HAS FINISHED
5119  032652  005737  101776                  TST     @#101776        ;SEE IF NPR DATO HAS INVALID THE XFER ADDR. IN CACHE
5120  032656  033727  177752  000004          BIT     @#HMR,#HMR2     ;LOC NOW A MISS? (CACHE INVALIDATED?)
5121  032664  001014                          BNE     T22L06          ;GO REPORT ERROR IF LOC A HIT
5122  032666  000737                          BR      T22L10          ;GO SEE IF DEVICE HAD AN ERROR
5123
5124  032670  012737  032436  001110  T22L05: MOV     #T22L11,@#$LPERR        ;INIT RETURN FOR ERROR LOOP
5125  032676  013737  032444  001160          MOV     ADD2H,$REG1     ;SAVE BAD ADDRESS
5126  032704  013737  032442  001162          MOV     ADD2L,$REG2     ;SAVE BAD ADDRESS
5127  032712  104043                          EPROR   43              ;ERROR: ADDRESS COULD NOT BE MADE A HIT
5128  032714  000417                          BR      T22L02          ;GO TO END OF TEST
5129
5130  032716  012737  032436  001110  T22L06: MOV     #T22L11,@#$LPERR  ;SETUP RETURN FOR ERROR LOOPS
5131  032724  013737  032444  001160          MOV     ADD2H,$REG1     ;SAVE BAD ADDRESS
5132  032732  013737  032442  001162          MOV     ADD2L,$REG2     ;SAVE BAD ADDRESS
5133  032740  005777  146264                  TST     @EAD            ;DID DEVICE HAVE AN ERROR?
5134  032744  100002                          BPL     1$              ;BRANCH IF NO
5135  032746  104103                          ERROR   103             ;ERROR: DEVICE ERROR BIT SET WHEN DOING DATO TO ADDR.
5136  032750  000401                          BR      T22L02          ;GO TO END OF TEST
5137
5138  032752  104104                  1$:     ERROR   104             ;ERROR: CACHE LOC NOT INVALID BY NPR DATO TO ADDR.
5139  032754  042737  000001  177572  T22L02: BIC     #1,@#MMR0       ;KT OFF
5140  032762  023727  001232  034046          CMP     SETUP,#HUBEN    ;WAS THE NEW UBE USED?
5141  032770  001013                          BNE     $EOP            ;IF NO, GO TO END-OF-PASS
5142  032772  013737  001226  001172          MOV     IVEC,$TMP0      ;GET UBE INTERRUPT VECTOR
5143  033000  062737  000002  001172          ADD     #2,$TMP0        ;AND RESTORE
5144  033006  013777  001172  146212          MOV     $TMP0,@#IVEC
5145  033014  005077  146152                  CLR     @$TMP0          ;THE TRAP CATCHER
5146
5147
5148
5149                                          .SBTTL  END OF PASS ROUTINE
5150
5151                                          ;;**************************************************************
5152                                          ;*INCREMENT THE PASS NUMBER ($PASS)
```

```
                                        ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO START1

033020                                  $EOP:
                                                SCOPE
033020  000004                                  CLR     $TSTNM          ;;ZERO THE TEST NUMBER
033022  005037  001102                          CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
033026  005037  035406                          INC     $PASS           ;;INCREMENT THE PASS NUMBER
033032  005237  001244                          BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
033036  042737  100000  001244                  DEC     (PC)+           ;;LOOP?
033044  005327                          $EOPCT: .WORD   1
033046  000001                                  BGT     $DOAGN          ;;YES
033050  003022                                  MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
033052  012737                          $ENDCT: .WORD   1
033054  000001                                  $EOPCT
033056  033046                                  TYPE    ,$ENDMG         ;;TYPE "END PASS #"
033060  104401  033125                          MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
033064  013746  001244                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
033070  104405                                  TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
033072  104401  033122                  $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
033076  013700  000042                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
033102  001405                                  RESET                   ;;CLEAR THE WORLD
033104  000005                          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
033106  004710                                  NOP                     ;;SAVE ROOM
033110  000240                                  NOP                     ;;FOR
033112  000240                                  NOP                     ;;ACT11
033114  000240                          $DOAGN:
033116                                          JMP     @(PC)+          ;;RETURN
033116  000137                          $RTNAD: .WORD   START1
033120  003056                          $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
033122      377       377       000   $ENDMG: .ASCIZ  <15><12>/END PASS #/
033125      015   042412  042116
033132  050040  051501  020123
033140  000043

                                        ;////////////////////////////////////////////////////////////////
                                        ;SUBROUTINE TO REPORT AN UNEXPECTED PARITY ERRORS
                                        ;////////////////////////////////////////////////////////////////

033142  012737  000214  177746  UPERR:  MOV     #214,@#CCR      ;TURN OFF CACHE TO PREVENT OTHER ERRORS
033150  011637  001166                  MOV     (SP),$REG4      ;SAVE PC+2 WHERE PARITY ERROR OCCURRED
033154  162737  000002  001166          SUB     #2,$REG4        ;CALC. PC WHERE PARITY ERROR OCCURRED
033162  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
033164  076600                          MED                     ;GET LOG INFOR FOR PHY. ADDR. A17,A16
033166  000101                          .WORD   R&ER
033170  000300                          SWAB    R0              ;PUT PHY. ADDR A17, A16 IN LOW BYTE
033172  042700  177776                  BIC     #177776,R0      ;ONLY LOOK AT A17, A16
033176  010037  001160                  MOV     R0,$REG1        ;SAVE ADDRESS
033202  076600                          MED                     ;GET LOG INFORMATION
033204  000102                          .WORD   LOADD
033206  010037  001162                  MOV     R0,$REG2        ;SAVE INFORMATION
033212  076600                          MED                     ;GET LOG INFORMATION
033214  000100                          .WORD   RJAM
033216  032700  000400                  BIT     #400,R0         ;WAS ERROR IN BACKING STORE?
033222  001016                          BNE     UP1             ;BRANCH IF YES
033224  032737  000040  177744          BIT     #40,@#EREG      ;WAS ERROR IN CACHE TAG FIELD?
```



```
033232  001017                          BNE     UP2             ;BRANCH IF YES
033234  032737  000100  177744          BIT     #100,@#EREG     ;WAS ERROR IN CACHE LOW BYTE?
033242  001024                          BNE     UP3             ;BRANCH IF YES
033244  076600                          MED                     ;GET LOG INFORMATION
033246  000106                          .WORD   CDH
033250  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
033254  104004                          ERROR   4               ;ERROR: UNEXPECTED PARITY ERROR IN CACHE DATA HIGH
033256  000423                          BR      UPR             ;RETURN

033260  013737  001166  001164  UP1:    MOV     $REG4,$REG3     ;SAVE PC OF TRAP
033266  104001                          ERROR   1               ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
033270  000416                          BR      UPR             ;RETURN

033272                          UP2:
033272  076600                          MED                     ;GET TAG LOG INFO.
033274  000107                          .WORD   RTAG
033276  000300                          SWAB    R0              ;PUT TAG IN LOW BYTE
033300  042700  177400                  BIC     #177400,R0      ;LOOK AT TAG ONLY
033304  010037  001164                  MOV     R0,$REG3        ;SAVE CACHE TAG DATA
033310  104002                          ERROR   2               ;ERROR: UNEXPECTED PARITY ERROR IN CACHE TAG
033312  000405                          BR      UPR             ;RETURN

033314                          UP3:
033314  076600                          MED                     ;GET LOG INFORMATION
033316  000106                          .WORD   CDL
033320  010037  001164                  MOV     R0,$REG3        ;SAVE INFORMATION
033324  104003                          ERROR   3               ;ERROR: UNEXPECTED PAPITY ERROR IN CACHE DATA LOW

033326                          UPR:
033326  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
033330  076600                          MED                     ;GET CONTENTS OF LOG REG
033332  000022                          .WORD   RLOG
033334  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
033340  076600                          MED                     ;UNLOCK ERROR LOG
033342  000222                          .WORD   WLOG
033344  012600                          MOV     (SP)+,R0        ;RESTORE R0

033346  000177  145662                  JMP     @SKTST          ;START SUBTEST FOLLOWING ONE WHERE ERROR OCCURRED
                                        ;////////////////////////////////////////////////////////////////
                                        ;ROUTINE TO REPORT UNEXPECTED TRAPS TO VECTOR 4
                                        ;////////////////////////////////////////////////////////////////
033352  012737  000214  177746  UT4:    MOV     #214,@#CCR      ;TURN OFF CACHE
033360  011637  001162                  MOV     (SP),$REG2      ;SAVE FAILING PC
033364  013737  177766  001160          MOV     @#CER,$REG1     ;GET CPU ERROR REG (CER)
033372  032777  001000  145534          BIT     #SW09,@SWR      ;LOOP ON ERROR?
033400  001401                          BEQ     1$              ;BRANCH IF NO
033402  022626                          CMP     (SP)+,(SP)+     ;RESTORE STACK
033404  104016                  1$:     ERROR   16              ;ERROR: UNEXPECTED TRAP TO VECTOR 4

033406  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
033410  076600                          MED                     ;GET CONTENTS OF LOG REG
033412  000022                          .WORD   RLOG
033414  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
033420  076600                          MED                     ;UNLOCK ERROR LOG
033422  000222                          .WORD   WLOG
```

```
5265  033424  012600                          MOV     (SP)+,R0        ;RESTORE R0
5266
5267  033426  000000                          HALT                    ;
5268  033430  000137  000200                  JMP     @#200           ;RESTART TEST IF CONTINUE
5269                                  ;////////////////////////////////////////////////////////////////////
5270                                  ;SUBROUTINE TO CONVERT VIRTUAL ADDRESS IN $TMP0 TO A PHYSICAL ADDRESS IN $REG2, $REG1
5271                                  ;////////////////////////////////////////////////////////////////////
5272
5273  033434  010146                  VIP:    MOV     R1,-(SP)        ;SAVE R1 ON STACK
5274  033436  010246                          MOV     R2,-(SP)        ;SAVE R2 ON STACK
5275  033440  013701  001172                  MOV     $TMP0,R1        ;GET VIRTUAL ADDRESS
5276  033444  005002                          CLR     R2              ;INT SHIFT COUNTER
5277  033446  006201                  1$:     ASR     R1              ;SHIFT BLOCK # TO LSB 0-6
5278  033450  005202                          INC     R2              ;COUNT SHIFTS
5279  033452  020227  000006                  CMP     R2,#6           ;ALL DONE?
5280  033456  001373                          BNE     1$              ;BRANCH IF NO
5281  033460  010137  001162                  MOV     R1,$REG2        ;SAVE BLOCK #
5282  033464  042737  177600  001162          BIC     #177600,$REG2   ;MASK BLOCK #
5283  033472  006201                  2$:     ASR     R1              ;SHIFT ACTIVE PAGE FIELD TO LSB 1-3
5284  033474  005202                          INC     R2              ;COUNT SHIFTS
5285  033476  020227  000014                  CMP     R2,#14          ;ALL DONE?
5286  033502  001373                          BNE     2$              ;BRANCH IF NO
5287  033504  042701  177761                  BIC     #177761,R1      ;CALC. APFX2
5288  033510  062701  172340                  ADD     #KIPAR0,R1      ;CALC ADDRESS OF PAR REFERENCING
5289  033514  011101                          MOV     (R1),R1         ;GET (PAR)
5290  033516  060137  001162                  ADD     R1,$REG2        ;CALC. PHYSICAL BLOCK #
5291  033522  013737  001162  001160          MOV     $REG2,$REG1     ;SAVE PHYSICAL ADDRESS BITS 17,16
5292  033530  005002                          CLR     R2              ;INI. SHIFT COUNT
5293  033532  006237  001160          3$:     ASR     $REG1           ;SHIFT ADDRESS BITS 17,16 TO LSB 1,0
5294  033536  005202                          INC     R2              ;COUNT SHIFTS
5295  033540  020227  000012                  CMP     R2,#12          ;DONE?
5296  033544  001372                          BNE     3$              ;BRANCH IF NO
5297  033546  005002                          CLR     R2              ;INIT. SHIFT COUNT
5298  033550  006337  001162          4$:     ASL     $REG2           ;SHIFT MSB OF ADDRESS TO BIT 16
5299  033554  005202                          INC     R2              ;COUNT SHIFTS
5300  033556  020227  000006                  CMP     R2,#6           ;ALL DONE?
5301  033562  001372                          BNE     4$              ;BRANCH IF NO
5302  033564  013701  001172                  MOV     $TMP0,R1        ;GET VIRTUAL ADDRESS
5303  033570  042701  177700                  BIC     #177700,R1      ;MASK OFF BLOCK COUNT
5304  033574  060137  001162                  ADD     R1,$REG2        ;HAVE $REG2 CONTAIN PHYSICAL ADDRESS 0-15
5305  033600  012602                          MOV     (SP)+,R2        ;RESTORE R2
5306  033602  012601                          MOV     (SP)+,R1        ;RESTORE R1
5307  033604  000207                          RTS     PC              ;RETURN
5308
5309                                  ;////////////////////////////////////////////////////////////////////
5310                                          ;SUBROUTINE TO CALC. TAG FIELD FROM A PAR IN LOC $TMP0
5311                                  ;////////////////////////////////////////////////////////////////////
5312
5313  033606  010146                  TAG:    MOV     R1,-(SP)        ;SAVE R1 ON STACK
5314  033610  012701  000005                  MOV     #5,R1           ;INIT R1 TO COUNT 5 SHIFTS
5315  033614  006237  001172          1$:     ASR     $TMP0           ;CALC TAG CONTENTS
5316  033620  077103                          SOB     R1,1$           ;ALL DONE?
5317  033622  052737  000200  001172          BIS     #200,$TMP0      ;SET VALID BIT
5318  033630  012601                          MOV     (SP)+,R1        ;RESTORE R1
5319  033632  000207                          RTS     PC              ;RETURN
5320
```



```
5321                                  ;////////////////////////////////////////////////////////////////////
5322                                          ;SUBROUTINE TO FIND PAR FROM A VIRTUAL ADDRESS IN R0 OR R1  AND
5323                                          ;PUT ITS CONTENTS IN $TMP0
5324                                  ;////////////////////////////////////////////////////////////////////
5325  033634  010037  001172          PAR:    MOV     R0,$TMP0        ;GET VIRTUAL ADDRESS
5326  033640  005776  000000                  TST     0(SP)           ;WAS R0 USED?
5327  033644  001402                          BEQ     1$              ;BRANCH IF YES
5328  033646  010137  001172                  MOV     R1,$TMP0        ;GET VIRTUAL ADDRESS
5329  033652  062716  000002          1$:     ADD     #2,(SP)         ;ADJUST PC
5330  033656  012705  000014                  MOV     #14,R5          ;INIT COUNT
5331  033662  006237  001172          2$:     ASR     $TMP0           ;SHIFT ADDRESS TO GET ACTIVE PAGE FIELD
5332  033666  077503                          SOB     R5,2$           ;APF IN LSB 1-3? BRANCH IF NO
5333  033670  042737  177761  001172          BIC     #177761,$TMP0   ;MASK APF X 2
5334  033676  062737  172340  001172          ADD     #KIPAR0,$TMP0   ;PUT PAR ADDRESS IN $TMP0
5335  033704  017737  145262  001172          MOV     @$TMP0,$TMP0    ;GET CONTENTS OF PAR
5336  033712  000207                          RTS     PC              ;RETURN
5337                                  ;////////////////////////////////////////////////////////////////////
5338                                          ;SUBROTINE TO GENERATE A TEST BUFFER ADDRESS 512(10) LOCATIONS FROM GIVEN
5339                                          ;ADDRESS FOLLOWING ITS CALL
5340                                  ;////////////////////////////////////////////////////////////////////
5341  033714  017637  000000  001172  HAD:    MOV     @(SP),$TMP0     ;GET ADDRESS TO BE USED
5342  033722  062716  000002                  ADD     #2,(SP)         ;ADJUST PC
5343  033726  062737  002000  001172          ADD     #2000,$TMP0     ;CALC. ADDR WITH ADDRESS BIT A10 COMPLEMENTED
5344  033734  042737  174000  001172          BIC     #174000,$TMP0   ;MASK A15-A11
5345  033742  032737  002000  001172          BIT     #2000,$TMP0     ;BIT 10 SET?
5346  033750  001004                          BNE     1$              ;BRANCH IF YES
5347  033752  062737  060000  001172          ADD     #BUFL,$TMP0     ;CALC TEST BUFFER ADDR.
5348  033760  000406                          BR      2$
5349
5350  033762  042737  002000  001172  1$:     BIC     #2000,$TMP0     ;ADJUST ADDRESS BIT A10
5351  033770  062737  062000  001172          ADD     #BUFH,$TMP0     ;CALC TEST BUFFER ADR.
5352  033776  000207                  2$:     RTS     PC              ;RETURN
5353                                  ;////////////////////////////////////////////////////////////////////
5354                                          ;SUBROUTINE TO SEE IF A NEW UNIBUS EXER. IS USED AND TO SETUP AN
5355                                          ;RTI IN ITS INTERRUPT VECTOR
5356                                  ;////////////////////////////////////////////////////////////////////
5357
5358  034000  023727  001232  034046  VEC:    CMP     SETUP,#HUBEN    ;NEW UBE USED?
5359  034006  001016                          BNE     1$              ;BRANCH IF NO
5360  034010  013737  001226  001172          MOV     IVEC,$TMP0      ;GET ITS INTERRUPT VECTOR
5361  034016  062737  000002  001172          ADD     #2,$TMP0
5362  034024  013777  001172  145174          MOV     $TMP0,@IVEC     ;PUT ON RTI
5363  034032  012777  000002  145132          MOV     $RTI,@$TMP0     ;IN ITS INTERRUPT AREA
5364  034040  005037  177776                  CLR     @#PSW           ;LOWER PRIORITY LEVEL FOR INTERRUPTS
5365  034044  000207                  1$:     RTS     PC              ;RETURN
5366
5367                                  ;////////////////////////////////////////////////////////////////////
5368                                          ;SUBROUTINE TO SETUP THE NEW UNIBUS EXERCISOR TO DO ONE NPR DATO
5369                                          ;TO THE ADDRESS FOLLOWING THE SUBROUTINE CALL
5370                                  ;////////////////////////////////////////////////////////////////////
5371
5372  034046  005037  001204          HUBEN:  CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY BIT
5373  034052  105777  145134          2$:     TSTB    @CREG1          ;READY BIT SET?
5374  034056  100421                          BMI     1$              ;BRANCH IF YES
5375  034060  005237  001204                  INC     $TMP5           ;WAIT FOR RDY TO SET
5376  034064  001372                          BNE     2$              ;BRANCH IF HAVEN'T WAITED MAX TIME
```

```
5377  034066  032777  020000  145040          BIT     #SW13,@SWR      ;INHIBIT TYPEOUTS?
5378  034074  001004                          BNE     3$              ;BRANCH IF YES
5379  034076  104401  041645                  TYPE    ,MSG13          ;DEVICE READY BIT DOES NOT SET
5380  034102  104401  041705                  TYPE    ,MSG14          ;FURTHER NPR DEVICE TESTS ABORTED
5381  034106  005726                  3$:     TST     (SP)+           ;RESTORE STACK FROM SUBROUTINE CALL
5382  034110  042737  000001  177572          BIC     #1,@#MMR0       ;KT OFF IF ON
5383  034116  000137  033020                  JMP     $EOP            ;GO TO END OF PROGRAM
5384  034122  005077  145070          1$:     CLR     @CREG3          ;CLEAR ANY ERROR BITS SET
5385  034126  012777  003040  145056          MOV     #3040,@CREG1    ;HAVE UBE DO INPR DATO DATA XFER
5386  034134  005077  145054                  CLR     @CREG2          ;HAVE UBE DO INPR DATO DATA XFER
5387  034140  012777  177777  145054          MOV     #177777,@CREG5  ;CYCLE COUNT=1 XFER
5388  034146  017677  000000  145044          MOV     @(SP),@CREG4    ;GET ADDRESS FOR XFER
5389  034154  062716  000002                  ADD     #2,(SP)         ;GET HIGH ADDRESS BITS A17, A16
5390  034160  057677  000000  145026          BIS     @(SP),@CREG2    ;PUT ADDRESS BITS IN CONTROL REG
5391  034166  062716  000002                  ADD     #2,(SP)         ;ADJUST PC FOR RETURN
5392  034172  000207                          RTS     PC              ;RETURN
5393
5394                                  ;////////////////////////////////////////////////////////////////////
5395                                          ;SUBROUTINE TO SETUP THE OLD UNIBUS EXERCISOR TO DO 1 NPR DATO
5396                                          ;TO THE ADDRESS FOLLOWING THE SUBROUTINE CALL.
5397                                  ;////////////////////////////////////////////////////////////////////
5398
5399  034174  012737  050200  170006  HUBEO:  MOV     #50200,@#170006 ;HAVE UBE DO 1 NPR DATO AND RELEASE BUS
5400  034202  012737  000002  170004          MOV     #2,@#170004     ;SET BYTE COUNT FOR 1 WORD XFER
5401  034210  017637  000000  170002          MOV     @(SP),@#170002  ;SET UP XFER ADDRESS
5402  034216  062716  000004                  ADD     #4,(SP)         ;ADJUST PC FOR RETURN
5403  034222  000207                          RTS     PC              ;RETURN
5404  034224  000000                  FAKE:   .WORD   0               ;FAKE ERROR REG. MSB=0 FOR NO ERRORS
5405
5406                                  ;////////////////////////////////////////////////////////////////////
5407                                          ;SUBROUTINE TO SETUP AN RK05 FOR 1 NPR DATO
5408                                          ;TO THE ADDRESS FOLLOWING THE SUBROUTINE CALL
5409                                  ;////////////////////////////////////////////////////////////////////
5410
5411  034226  005037  001204          HRK05:  CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY BIT
5412  034232  105737  177404          2$:     TSTB    @#RKCS          ;IS CONTROLLER RDY?
5413  034236  100421                          BMI     1$              ;BRANCH IF YES
5414  034240  005237  001204                  INC     $TMP5           ;WAIT FOR RDY TO SET
5415  034244  001372                          BNE     2$              ;BRANCH IF HAVEN'T WAITED MAX TIME
5416  034246  042737  000001  177572  5$:     BIC     #1,@#MMR0       ;KT OFF IF ON
5417  034254  032777  020000  144652          BIT     #SW13,@SWR      ;INHIBIT TYPEOUTS?
5418  034262  001004                          BNE     9$              ;BRANCH IF YES
5419  034264  104401  041645                  TYPE    ,MSG13          ;DEVICE RDY BIT DOES NOT SET
5420  034270  104401  041705                  TYPE    ,MSG14          ;FURTHER NPR TESTS ABORTED
5421  034274  005726                  9$:     TST     (SP)+           ;RESTORE STACK FROM SUBROUTINE CALL
5422  034276  000137  033020                  JMP     $EOP            ;GO TO END OF PROGRAM
5423
5424  034302  005037  001204          1$:     CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY BIT
5425  034306  032737  000100  177400  4$:     BIT     #100,@#RKDS     ;IS DRIVE RDY?
5426  034314  001004                          BNE     3$              ;BRANCH IF YES
5427  034316  005237  001204                  INC     $TMP5           ;WAIT FOR RDY TO SET
5428  034322  001371                          BNE     4$              ;BRANCH IF HAVEN'T WAITED MAX TIME
5429  034324  000750                          BR      5$              ;REPORT DEVICE NOT READY
5430
5431  034326  012737  000001  177404  3$:     MOV     #1,@#RKCS       ;RESET CONTROLLER
5432  034334  005037  001204                  CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY BIT
```



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5433  034340  105737  177404          7$:     TSTB    @#RKCS          ;CONTROLLER RDY?
5434  034344  100404                          BMI     6$              ;BRANCH IF YES
5435  034346  005237  001204                  INC     $TMP5           ;WAIT FOR RDY TO SET
5436  034352  001372                          BNE     7$              ;BRANCH IF HAVEN'T WAITED MAX TIME
5437  034354  000734                          BR      5$              ;REPORT DEVICE NOT RDY
5438
5439  034356  012737  177777  177406  6$:     MOV     #-1,@#RKWC      ;SET WORD COUNT FOR 1 XFER
5440  034364  013737  001214  177412          MOV     @#CREG2,@#RKDA  ;SET UP DISK ADDRESS REG
5441  034372  012737  000004  177404          MOV     #4,@#RKCS       ;SET UP DISK TO DO DATO
5442  034400  017637  000000  177410          MOV     @(SP),@#RKBA    ;SET UP XFER ADDRESS
5443  034406  062716  000002                  ADD     #2,(SP)         ;LOOK AT HIGH ADDRESS BITS
5444  034412  017637  000000  001204          MOV     @(SP),$TMP5     ;GET HIGH ADDRESS BITS
5445  034420  062716  000002                  ADD     #2,(SP)         ;ADJUST PC FOR RETURN
5446  034424  005037  001202                  CLR     $TMP4           ;INIT COUNT FOR SHIFT
5447  034430  006337  001204          8$:     ASL     $TMP5           ;SHIFT ADDRESS BITS TO RKCS ADDR. BIT'S POSITION
5448  034434  005237  001202                  INC     $TMP4           ;COUNT SHIFTS
5449  034440  023727  001202  000004          CMP     $TMP4,$4        ;ALL DONE?
5450  034446  001370                          BNE     8$              ;BRANCH IF NO
5451  034450  053737  001204  177404          BIS     $TMP5,@#RKCS    ;SET UP THE EXTENDED MEMORY BITS
5452  034456  000207                          RTS     PC              ;RETURN
5453
5454                                  ;////////////////////////////////////////////////////////////////////
5455                                          ;SUBROUTINE TO SETUP AN RP03 TO DO 1 NPR DATO
5456                                          ;TO THE ADDRESS FOLLOWING THE SUBROUTINE CALL
5457                                  ;////////////////////////////////////////////////////////////////////
5458
5459  034460  005737  176714          HRP03:  TST     @#RPCS          ;ANY ERRORS?
5460  034464  001416                          BEQ     1$              ;BRANCH IF NO
5461  034466  042737  000001  177572          BIC     #1,@#MMR0       ;KT OFF IF ON
5462  034474  032777  020000  144432          BIT     #SW13,@SWR      ;INHIBIT TYPEOUTS?
5463  034502  001004                          BNE     2$              ;BRANCH IF YES
5464  034504  104401  041614                  TYPE    ,MSG12          ;DEVICE ERROR BIT SET
5465  034510  104401  041705                  TYPE    ,MSG14          ;FURTHER NPR TESTS ABORTED
5466  034514  005726                  2$:     TST     (SP)+           ;RESTORE STACK FROM SUBROUTINE CALL
5467  034516  000137  033020                  JMP     $EOP            ;GO TO END OF PROG
5468
5469  034522  005037  001204          1$:     CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY BIT
5470  034526  105737  176714          4$:     TSTB    @#RPCS          ;CONTROLLER RDY?
5471  034532  100421                          BMI     3$              ;BRANCH IF YES
5472  034534  005237  001204                  INC     $TMP5           ;WAIT FOR RDY TO SET
5473  034540  001372                          BNE     4$              ;BRANCH IF HAVEN'T WAITED MAX TIME
5474  034542  042737  000001  177572  8$:     BIC     #1,@#MMR0       ;KT OFF IF ON
5475  034550  032777  020000  144356          BIT     #SW13,@SWR      ;INHIBIT TYPEOUTS?
5476  034556  001004                          BNE     5$              ;BRANCH IF YES
5477  034560  104401  041645                  TYPE    ,MSG13          ;DEVICE RDY BIT DID NOT SET
5478  034564  104401  041705                  TYPE    ,MSG14          ;FURTHER NPR DEVICE TEST ABORTED
5479  034570  005726                  5$:     TST     (SP)+           ;RESTORE STACK FROM SUBROUTINE CALL
5480  034572  000137  033020                  JMP     $EOP            ;GO TO END OF PROG
5481
5482  034576  005037  001204          3$:     CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY BIT
5483  034602  005737  176710          7$:     TST     @#RPDS          ;IS DEVICE RDY?
5484  034606  100404                          BMI     6$              ;BRANCH IF YES
5485  034610  005237  001204                  INC     $TMP5           ;WAIT FOR RDY TO SET
5486  034614  001372                          BNE     7$              ;BRANCH IF HAVEN'T WAITED MAX TIME
5487  034616  000751                          BR      8$              ;REPORT RDY DID NOT SET
5488
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5489  034620  012737  177776  176716  6$:     MOV     #-2,@#RPWC      ;SET UP TO DO MIN # OF XFERS(2)
5490  034626  013737  001214  176714          MOV     CREG2,@#RPCS    ;START TO SETUP CONTROLLER FOR NPR DATO
5491  034634  017637  000000  176720          MOV     @(SP),@#RPBA    ;SETUP XFER ADDRESS
5492  034642  062716  000002                  ADD     #2,(SP)         ;LOOK AT HIGH XFER ADDRESS
5493  034646  017637  000000  001202          MOV     @(SP),$TMP4     ;GET HIGH XFER ADDR.
5494  034654  062716  000002                  ADD     #2,(SP)         ;ADJUST PC FOR RETURN
5495  034660  005037  001204                  CLR     $TMP5           ;INIT SHIFT COUNTER
5496  034664  006337  001202          9$:     ASL     $TMP4           ;SHIFT ADDR. BITS TO COINCIDE WITH RPCS EXTENDED ADDR. B
5497  034670  005237  001204                  INC     $TMP5           ;COUNT SHIFTS
5498  034674  022737  000004  001204          CMP     #4,$TMP5        ;FINISHED?
5499  034702  001370                          BNE     9$              ;BRANCH IF NO
5500  034704  053737  001202  176714          BIS     $TMP4,@#RPCS    ;SETUP THE EXTENDED MEM ADDR.
5501  034712  000207                          RTS     PC              ;RETURN
5502
5503                                  ;////////////////////////////////////////////////////////////////////
5504                                          ;SUBROUTINE TO SETUP A TU10 TO DO NPR DATO XFERS
5505                                          ;TO THE STARTING ADDRESS FOLLOWING THE SUBROUTINE CALL
5506                                  ;////////////////////////////////////////////////////////////////////
5507
5508  034714  052737  010000  172522  HTU10:  BIS     #10000,@#MTC    ;POWER CLEAR THE UNIT
5509  034722  000240                          NOP                     ;WAIT FOR POWER CLEAR
5510  034724  000240                          NOP
5511  034726  012737  177777  172524          MOV     #-1,@#MTBRC     ;PREPARE TO BACKSPACE ONE RECORD
5512  034734  013737  001214  172522          MOV     CREG2,@#MTC     ;GET CONTROL MASK
5513  034742  052737  000012  172522          BIS     #12,@#MTC       ;SET UP BACKSPACE COMMAND
5514  034750  005237  172522                  INC     @#MTC           ;BACKSPACE
5515  034754  005037  001204                  CLR     $TMP5           ;INIT COUNTER TO WAIT FOR RDY
5516  034760  032737  000001  172520  2$:     BIT     #1,@#MTS        ;UNIT DONE?
5517  034766  001021                          BNE     1$              ;BRANCH IF YES
5518  034770  005237  001204                  INC     $TMP5           ;WAIT TILL UNIT DONE
5519  034774  001371                          BNE     2$              ;BRANCH IF HAVEN'T WAITED MAX TIME
5520  034776  005726                          TST     (SP)+           ;RESTORE STACK FROM SUBROUTINE CALL
5521  035000  042737  000001  177572          BIC     #1,@#MMR0       ;KT OFF IF ON
5522  035006  032777  020000  144120          BIT     #SW13,@SWR      ;INHIBIT TYPEOUTS?
5523  035014  001004                          BNE     3$              ;BRANCH IF YES
5524  035016  104401  041645                  TYPE    ,MSG13          ;RDY BIT DID NOT SET
5525  035022  104401  041705                  TYPE    ,MSG14          ;ABORT ALL TESTS USING NPR DEVICE
5526  035026  000137  033020          3$:     JMP     $EOP            ;GO TO END OF PROGRAM
5527
5528  035032  013737  001214  172522  1$:     MOV     CREG2,@#MTC     ;GET CONTROL MASK
5529  035040  052737  000002  172522          BIS     #2,@#MTC        ;SETUP CONTROL TO DO READ
5530  035046  012737  177760  172524          MOV     #-20,@#MTBRC    ;PREPARE TO READ MIN # OF BYTES [20(8)]
5531  035054  017637  000000  172526          MOV     @(SP),@#MTCMA   ;SETUP XFER ADDRESS
5532  035062  062716  000002                  ADD     #2,(SP)         ;LOOK AT HIGH ADDRESS
5533  035066  017637  000000  001202          MOV     @(SP),$TMP4     ;GET HIGH ADDRESS
5534  035074  005037  001204                  CLR     $TMP5           ;INIT SHIFT COUNTER
5535  035100  006337  001202          4$:     ASL     $TMP4           ;SHIFT ADDR. BITS TO COINCIDE WITH MTC ADDR BITS
5536  035104  005237  001204                  INC     $TMP5           ;COUNT SHIFTS
5537  035110  022737  000004  001204          CMP     #4,$TMP5        ;DONE?
5538  035116  001370                          BNE     4$              ;BRANCH IF NO
5539  035120  053737  001202  172522          BIS     $TMP4,@#MTC     ;SETUP HIGH ADDRESS BITS
5540  035126  062716  000002                  ADD     #2,(SP)         ;ADJUST PC FOR RETURN
5541  035132  000207                          RTS     PC              ;RETURN
5542                                  ;////////////////////////////////////////////////////////////////////
5543                                          ;SUBROUTINE TO RID CACHE OF BAD PARITY BY
5544                                          ;OVERWRITTING IT WHEN CACHE IS OFF
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5545                                  ;////////////////////////////////////////////////////////////////////
5546  035134  012705  060000  SWEEP:  MOV     #BUFL,R5        ;GET STARTING ADDRESS
5547  035140  011525          64$:    MOV     (R5),(R5)+      ;WRITE ALL CACHE WITH GOOD PARITY
5548  035142  020527  064000          CMP     R5,#BUFL+4000   ;ALL CACHE WRITTEN?
5549  035146  001374                  BNE     64$             ;BRANCH IF NO
5550  035150  000207                  RTS     PC              ;RETURN
5551
5552                                  .SBTTL  SCOPE HANDLER ROUTINE
5553
5554                                  ;;*****************************************************************
5555                                  ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
5556                                  ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
5557                                  ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
5558                                  ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
5559                                  ;*SW14=1         LOOP ON TEST
5560                                  ;*SW11=1         INHIBIT ITERATIONS
5561                                  ;*SW09=1         LOOP ON ERROR
5562                                  ;*CALL
5563                                  ;*      SCOPE           ;;SCOPE=IOT
5564
5565  035152                          $SCOPE:
5566  035152  032777  040000  143754  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
5567  035160  001104                  BNE     $OVER           ;;YES IF SW14=1
5568                                  ;#####START OF CODE FOR THE XOR TESTER#####
5569  035162  000416          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
5570                                                          ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
5571  035164  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
5572  035170  012737  035210  000004          MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
5573  035176  005737  177060                  TST     @#177060        ;;TIME OUT ON XOR?
5574  035202  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
5575  035206  000453                          BR      $SVLAD          ;;GO TO THE NEXT TEST
5576  035210  022626          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
5577  035212  012637  000004                  MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
5578  035216  000413                          BR      7$              ;;LOOP ON THE PRESENT TEST
5579  035220                          6$:;#####END OF CODE FOR THE XOR TESTER#####
5580  035220  105737  001103          2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
5581  035224  001421                          BEQ     3$              ;;BR IF NO
5582  035226  123737  001115  001103          CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
5583  035234  101015                          BHI     3$              ;;BR IF NO
5584  035236  032777  001000  143670          BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
5585  035244  001404                          BEQ     4$              ;;BR IF NO
5586  035246  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
5587  035254  000446                          BR      $OVER
5588  035256  105037  001103          4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
5589  035262  005037  035406                  CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
5590  035266  000415                          BR      1$              ;;ESCAPE TO THE NEXT TEST
5591  035270  032777  004000  143636  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
5592  035276  001011                          BNE     1$              ;;BR IF YES
5593  035300  005737  001244                  TST     $PASS           ;;IF FIRST PASS OF PROGRAM
5594  035304  001406                          BEQ     1$              ;;      INHIBIT ITERATIONS
5595  035306  005237  001104                  INC     $ICNT           ;;INCREMENT ITERATION COUNT
5596  035312  023737  035406  001104          CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
5597  035320  002024                          BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
5598  035322  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
5599  035330  013737  035410  035406          MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
5600  035336  105237  001102          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
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5601  035342  113737  001102  001242          MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
5602  035350  011637  001106                  MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
5603  035354  011637  001110                  MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
5604  035360  005037  035606                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
5605  035364  112737  000001  001115          MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
5606  035372  013777  001102  143536  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
5607  035400  013716  001106                  MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
5608  035404  000002                          RTI                     ;;FIXES PS
5609  035406  000000          $TIMES: 0                               ;;NUMBER OF ITERATIONS TO PERFORM
5610  035410  000005          $MXCNT: 5.                              ;;MAX. NUMBER OF ITERATIONS
5611                          .SBTTL  ERROR HANDLER ROUTINE
5612
5613                          ;;**************************************************************
5614                          ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
5615                          ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
5616                          ;*AND GO TO $ERRTYP ON ERROR
5617                          ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
5618                          ;*SW15=1        HALT ON ERROR
5619                          ;*SW13=1        INHIBIT ERROR TYPEOUTS
5620                          ;*SW10=1        BELL ON ERROR
5621                          ;*SW09=1        LOOP ON ERROR
5622                          ;*CALL
5623                          ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
5624
5625  035412                  $ERROR:
5626  035412  105237  001103  7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
5627  035416  001775                  BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
5628  035420  013777  001102  143510          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
5629  035426  032777  002000  143500          BIT     $BIT10,@SWR     ;;BELL ON ERROR?
5630  035434  001402                          BEQ     1$              ;;NO - SKIP
5631  035436  104401  035610                  TYPE    ,$BELL          ;;RING BELL
5632  035442  005237  001112  1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
5633  035446  011637  001116                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
5634  035452  162737  000002  001116          SUB     #2,$ERRPC
5635  035460  117737  143432  001114          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
5636  035466  032777  020000  143440          BIT     $BIT13,@SWR     ;;SKIP TYPEOUT IF SET
5637  035474  001004                          BNE     20$             ;;SKIP TYPEOUTS
5638  035476  004737  035614                  JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
5639  035502  104401  001207                  TYPE    ,$CRLF
5640  035506                  20$:
5641  035506  122737  000001  001256          CMPB    $APTENV,$ENV    ;;RUNNING IN APT MODE
5642  035514  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
5643  035516  113737  001114  035530          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
5644  035524  004737  037050                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
5645  035530     000          21$:    .BYTE   0
5646  035531     000                  .BYTE   0
5647  035532  000777          22$:    BR      22$             ;;APT ERROR LOOP
5648  035534  005777  143374  2$:     TST     @SWR            ;;HALT ON ERROR
5649  035540  100001                  BPL     3$              ;;SKIP IF CONTINUE
5650  035542  000000                  HALT                    ;;HALT ON ERROR!
5651  035544  032777  001000  143362  3$:     BIT     $BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
5652  035552  001402                          BEQ     4$              ;;BR IF NO
5653  035554  013716  001110                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
5654  035560  005737  035606  4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
5655  035564  001402                          BEQ     5$              ;;BR IF NONE
5656  035566  013716  035606                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
```



```
5657  035572                  5$:
5658  035572  022737  033106  000042          CMP     $$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
5659  035600  001001                          BNE     6$              ;;BRANCH IF NO
5660  035602  000000                          HALT                    ;;YES
5661  035604                  6$:
5662  035604  000002                          RTI                     ;;RETURN
5663  035606  000000          $ESCAPE: .WORD  0               ;;ESCAPE ON ERROR ADDRESS
5664  035610  177607  000377  $BELL:  .ASCIZ  <207><377><377> ;;ASCII CODE FOR BELL
5665                          .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE
5666
5667                          ;;**************************************************************
5668                          ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
5669                          ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
5670                          ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
5671
5672  035614                  $ERRTYP:

5673  035614  104401  001207          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
5674  035620  010046                  MOV     R0,-(SP)        ;;SAVE R0
5675  035622  005000                  CLR     R0              ;;PICKUP THE ITEM INDEX
5676  035624  153700  001114          BISB    @#$ITEMB,R0
5677  035630  001004                  BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
5678                                                          ;;TYPE THE PC OF THE ERROR
5679  035632  013746  001116          MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
5680                                                          ;;ERROR ADDRESS
5681  035636  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
5682  035640  000426                  BR      6$              ;;GET OUT
5683  035642  005300          1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
5684  035644  006300                  ASL     R0              ;;      WORK FOR THE ERROR TABLE
5685  035646  006300                  ASL     R0
5686  035650  006300                  ASL     R0
5687  035652  062700  055074          ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
5688  035656  012037  035666          MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
5689  035662  001404                  BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
5690  035664  104401                  TYPE                    ;;TYPE THE "ERROR MESSAGE"
5691  035666  000000          2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
5692  035670  104401  001207          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
5693  035674  012037  035704  3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
5694  035700  001404                  BEQ     5$              ;;SKIP TYPEOUT IF 0
5695  035702  104401                  TYPE                    ;;TYPE THE "DATA HEADER"
5696  035704  000000          4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
5697  035706  104401  001207          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
5698  035712  011000          5$:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
5699  035714  001004                  BNE     7$              ;;GO TYPE THE DATA
5700  035716  012600          6$:     MOV     (SP)+,R0        ;;RESTORE R0
5701  035720  104401  001207          TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
5702  035724  000207                  RTS     PC              ;;RETURN
5703  035726                  7$:
5704  035726  013046                  MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
5705  035730  104402                  TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
5706  035732  005710                  TST     (R0)            ;;IS THERE ANOTHER NUMBER?
5707  035734  001770                  BEQ     6$              ;;BR IF NO
5708  035736  104401  035744          TYPE    ,8$             ;;TYPE TWO(2) SPACES
5709  035742  000771                  BR      7$              ;;LOOP
5710  035744  020040     000  8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
5711          035750                  .EVEN
5712                                  .SBTTL          ROUTINE TO SIZE MEMORY
```

```
                                        ;;*************************************************************************
                                        ;*CALL:
                                        ;*      JSR             PC,$SIZE
                                        ;*      RETURN
                                        ;*$LSTAD WILL CONTAIN:
                                        ;*      WITH KT11=-LAST VIRTUAL ADDRESS OF THE LAST BANK
                                        ;*      WITHOUT KT11 =-LAST ABSOLUTE ADDRESS OF AVAILABLE MEMORY
                                        ;*$LSTBK  WILL CONTAIN THE LAST BANK AS A SAF
                                        ;*
                                        ;*$KT11 IS THE MEMORY MANAGEMENT KEY
                                        ;*BIT@7 = @ DON'T USE MEMORY MANAGEMENT
                                        ;*      MUST BE SET UP BEFORE THE CALL
                                        ;*BIT15 =@ DON'T HAVE MEMORY MANAGEMENT OPTION
                                        ;*      DETERMINED BY ROUTINE
                                        
035750  010046                  $SIZE:  MOV     R0,-(SP)        ;SAVE R0 ON THE STACK
035752  010146                          MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
035754  010246                          MOV     R2,-(SP)        ;;SAVE R2 ON THE STACK
035756  010346                          MOV     R3,-(SP)        ;;SAVE R3 ON THE STACK
035760  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
035764  013746  000006                  MOV     @#ERRVEC+2,-(SP)
035770  010600                          MOV     SP,R0           ;;SAVE THE STACK POINTER
                                        ;;SET THE ERRVEC PS TO THE PRESENT PS
035772  013746  000034                  MOV     @#TRAPVEC,-(SP) ;;SAVE CURRENT TRAP VECTOR
035776  012737  036006  000034          MOV     #64$,@#TRAPVEC  ;;SETUP NEW TRAP VECTOR
036004  104400                          TRAP                    ;;PUSH OLD PSW AND PC ON STACK
036006  016637  000002  000006  64$:    MOV     2(SP),@#ERRVEC+2  ;;SAVE PSW IN @#ERRVEC+2
036014  012716  036022                  MOV     #65$,(SP)       ;;REPLACE OLD PC WITH NEW
036020  000002                          RTI                     ;;RESTORE PSW
036022  012637  000034          65$:    MOV     (SP)+,@#TRAPVEC ;;RESTORE OLD TRAP VECTOR
036026  012701  003776                  MOV     #3776,R1        ;;SETUP ADDRESS
036032  105727                          TSTB    (PC)+           ;;USE MEMORY MANAGEMENT?
036034  000200                  $KT11:  .WORD   200             ;;SET TO USE MEMORY MANAGEMENT
036036  100062                          BPL     $CORE           ;;BR IF NO
036040  012737  036176  000004          MOV     #$KTNEX,@#ERRVEC  ;;SET FOR TIMEOUT
036046  005737  177572                  TST     @#SR0           ;;KT11 ARE YOU THERE?
036052  052737  100000  036034          BIS     #100000,$KT11   ;;YES--SET KT11 KEY
036060  005046                          CLR     -(SP)           ;INITIALIZE FOR "PAR" LOADING
036062  012702  172340                  MOV     #KIPAR0,R2      ;;ADDRESS OF FIRST "PAR"
036066  012703  000010                  MOV     #"D8,R3         ;;LOAD EIGHT "PAR.'S" AND EIGHT "PDR.'S"
036072  012762  077406  177740  1$:     MOV     #77406,-40(R2)  ;;PDR = 4K, UP, READ/WRITE
036100  011622                          MOV     (SP),(R2)+      ;;LOAD "PAR"
036102  062716  000200                  ADD     #200,(SP)       ;;UPDATE FOR NEXT "PAR"
036106  077307                          SOB     R3,1$           ;;LOOP UNTIL ALL EIGHT ARE LOADED
036110  012742  177600                  MOV     #177600,-(R2)   ;;SETUP KIPAR7 FOR I/O
036114  005042                          CLR     -(R2)           ;;SETUP KIPAR6 FOR TESTING
036116  012737  036134  000004          MOV     #2$,@#ERRVEC    ;;CATCH TIMEOUT IF NO SR3
036124  012737  000020  172516          MOV     #20,@#SR3       ;;ENABLE 22 BIT MODE
036132  000401                          BR      3$              ;;THIS PDP-11 HAS A SR3 REGISTER
036134  022626                  2$:     CMP     (SP)+,(SP)+     ;;CLEAN OFF THE STACK--NO SR3
036136  005237  177572          3$:     INC     @#SR0           ;;TURN ON MEMORY MANAGEMENT
036142  012737  036166  000004          MOV     #$KTOUT,@#ERRVEC  ;;SET FOR TIME OUT
036150  005737  143776          4$:     TST     @#143776        ;;TRAP ON NON-EX-MEM
036154  062712  000040                  ADD     #40,(R2)        ;;MAKE A 1K STEP
036160  023712  172356                  CMP     @#KIPAR7,(R2)   ;;LAST ONE?
```



```
036164  101371                          BHI     4$              ;;NO--TRY IT
036166  011202                  $KTOUT: MOV     (R2),R2         ;;GET LAST BANK+1
036170  005037  177572                  CLR     @#SR0           ;;TURN OFF MEMORY MANAGEMENT
036174  000421                          BR      $SIZEX
036176  042737  100000  036034  $KTNEX: BIC     #100000,$KT11   ;;KT11 NON-EXISTENT
036204  012737  036234  000004  $CORE:  MOV     #$CROUT,@#ERRVEC  ;;SET FOR TIMEOUT
036212  005002                          CLR     R2              ;;SET UP BANK
036214  062701  004000          1$:     ADD     #4000,R1        ;;INCREMENT BY 1K
036220  062702  000040                  ADD     #40,R2          ;;1K STEP
036224  005711                          TST     (R1)            ;;TRAP ON TIME OUT
036226  022701  177776                  CMP     #177776,R1      ;;LAST ONE
036232  001370                          BNE     1$              ;;NO--TRY AGAIN
036234  162701  004000  $CROUT: SUB     #4000,R1
036240  162702  000040  $SIZEX: SUB     #40,R2          ;;DROP BACK
036244  010006                          MOV     R0,SP           ;;RESTORE THE STACK
036246  012637  000006                  MOV     (SP)+,@#ERRVEC+2  ;;RESTORE ERROR VECTOR
036252  012637  000004                  MOV     (SP)+,@#ERRVEC
036256  010137  036320                  MOV     R1,$LSTAD       ;;LAST ADDRESS
036262  010237  036322                  MOV     R2,$LSTBK       ;;LAST BANK
036266  012603                          MOV     (SP)+,R3        ;;RESTORE R3
036270  012602                          MOV     (SP)+,R2        ;;RESTORE R2
036272  012601                          MOV     (SP)+,R1        ;;RESTORE R1
036274  012600                          MOV     (SP)+,R0        ;;RESTORE R0

036276  010046                          MOV     R0,-(SP)        ;SAVE R0 FOR MED INST
036300  076600                          MED                     ;GET CONTENTS OF LOG REG
036302  000022                          .WORD   RLOG
036304  052700  100001                  BIS     #100001,R0      ;ENABLE ERROR LOG & LOG FIRST MODE
036310  076600                          MED                     ;UNLOCK ERROR LOG
036312  000222                          .WORD   WLOG
036314  012600                          MOV     (SP)+,R0        ;RESTORE R0

036316  000207                          RTS     PC
036320  000000                  $LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
036322  000000                  $LSTBK: .WORD   0               ;;CONTAINS THE LAST BANK
                                        .SBTTL  CONVERT BINARY TO DECIMAL AND TYPE ROUTINE

                                        ;;*************************************************************
                                        ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 5-DIGIT
                                        ;*SIGNED DECIMAL (ASCII) NUMBER AND TYPE IT. DEPENDING ON WHETHER THE
                                        ;*NUMBER IS POSITIVE OR NEGATIVE A SPACE OR A MINUS SIGN WILL BE TYPED
                                        ;*BEFORE THE FIRST DIGIT OF THE NUMBER. LEADING ZEROS WILL ALWAYS BE
                                        ;*REPLACED WITH SPACES.
                                        ;*CALL:
                                        ;*      MOV     NUM,-(SP)       ;;PUT THE BINARY NUMBER ON THE STACK
                                        ;*      TYPDS                   ;;GO TO THE ROUTINE

036324                                  $TYPDS:
036324  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
036326  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
036330  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
036332  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
036334  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
036336  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
036342  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
036346  100004                          BPL     1$              ;;BR IF INPUT IS POS.
```

```
5825  036350  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
5826  036352  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
5827  036360  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
5828  036362  012703  036540                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
5829  036366  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
5830  036372  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
5831  036374  016001  036530                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
5832  036400  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
5833  036402  002402                          BLT     4$              ;;BR IF DONE
5834  036404  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
5835  036406  000774                          BR      3$
5836  036410  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
5837  036412  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
5838  036414  001002                          BNE     5$              ;;FALL THROUGH IF 0
5839  036416  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
5840  036420  100407                          BMI     7$              ;;BR IF YES
5841  036422  106316                  5$:     ASLB    (SP)            ;;MSD?
5842  036424  103003                          BCC     6$              ;;BR IF NO
5843  036426  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
5844  036434  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
5845  036440  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
5846  036444  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
5847  036446  005720                          TST     (R0)+           ;;JUST INCREMENTING
5848  036450  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
5849  036454  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
5850  036456  003002                          BGT     8$              ;;GO TO EXIT
5851  036460  010502                          MOV     R5,R2           ;;GET THE LSD
5852  036462  000764                          BR      6$              ;;GO CHANGE TO ASCII
5853  036464  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
5854  036466  100003                          BPL     9$              ;;BR IF NO
5855  036470  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
5856  036476  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
5857  036500  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
5858  036502  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
5859  036504  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
5860  036506  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
5861  036510  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
5862  036512  104401  036540                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
5863  036516  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
5864  036524  012616                          MOV     (SP)+,(SP)
5865  036526  000002                          RTI                     ;;RETURN TO USER
5866  036530  023420                  $DTBL:  10000.
5867  036532  001750                          1000.
5868  036534  000144                          100.
5869  036536  000012                          10.
5870  036540  000004                  $DBLK:  .BLKW   4
5871                                  .SBTTL  TYPE ROUTINE
5872
5873                                  ;;*****************************************************************
5874                                  ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
5875                                  ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
5876                                  ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
5877                                  ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
5878                                  ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
5879                                  ;*
5880                                  ;*CALL:
```



```
5881                                  ;*1) USING A TRAP INSTRUCTION
5882                                  ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
5883                                  ;*OR
5884                                  ;*      TYPE
5885                                  ;*      MESADR
5886                                  ;*
5887
5888  036550  105737  001153          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
5889  036554  100002                          BPL     1$              ;;BR IF YES
5890  036556  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
5891  036560  000430                          BR      3$              ;;LEAVE
5892  036562  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
5893  036564  017600  000002                  MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
5894  036570  122737  000001  001256          CMPB    $APTENV,$ENV    ;;RUNNING IN APT MODE
5895  036576  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
5896  036600  132737  000100  001257          BITB    #APT$POOL,$ENVM ;;SPOOL MESSAGE TO APT
5897  036606  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
5898  036610  010037  036620                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
5899  036614  004737  037040                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
5900  036620  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
5901  036622  132737  000040  001257  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
5902  036630  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
5903  036632  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
5904  036634  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
5905  036636  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
5906  036640  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
5907  036642  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
5908  036646  000002                          RTI                     ;;RETURN
5909  036650  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
5910  036654  001430                          BEQ     8$
5911  036656  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
5912  036662  001006                          BNE     5$
5913  036664  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
5914  036666  104401                          TYPE                    ;;TYPE A CR AND LF
5915  036670  001207                          $CRLF
5916  036672  105037  037026                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
5917  036676  000755                          BR      2$              ;;GET NEXT CHARACTER
5918  036700  004737  036762          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
5919  036704  123726  001152          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
5920  036710  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
5921  036712  013746  001150                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
5922                                                                  ;;AND THE NULL CHAR.
5923  036716  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
5924  036722  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
5925  036724  004737  036762                  JSR     PC,$TYPEC       ;;GO TYPE A NULL
5926  036730  105337  037026                  DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
5927  036734  000770                          BR      7$              ;;LOOP
5928
5929                                  ;HORIZONTAL TAB PROCESSOR
5930
5931  036736  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
5932  036742  004737  036762          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
5933  036746  132737  000007  037026          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
5934  036754  001372                          BNE     9$              ;;TAB STOP
5935  036756  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
5936  036760  000724                          BR      2$              ;;GET NEXT CHARACTER
```

```
5937  036762  105777  142156          $TYPEC: TSTB    @#TPS           ;;WAIT UNTIL PRINTER IS READY
5938  036766  100375                          BPL     $TYPEC
5939  036770  116677  000002  142150          MOVB    2(SP),@#TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
5940  036776  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
5941  037004  001003                          BNE     1$              ;;BRANCH IF NO
5942  037006  105037  037026                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
5943  037012  000406                          BR      $TYPEX          ;;EXIT
5944  037014  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
5945  037022  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
5946  037024  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
5947  037026  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
5948  037030  000207          $TYPEX: RTS     PC
5949
5950                                  .SBTTL  APT COMMUNICATIONS ROUTINE
5951
5952                                  ;;**************************************************************
5953  037032  112737  000001  037276  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
5954  037040  112737  000001  037274  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
5955  037046  000403                          BR      $ATYC
5956  037050  112737  000001  037276  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
5957  037056          $ATYC:
5958  037056  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
5959  037060  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
5960  037062  105737  037274                  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
5961  037066  001450                          BEQ     5$              ;;IF NOT:  BR
5962  037070  172737  000001  001256          CMPB    $APTENV,$ENV    ;;OPERATING UNDER APT?
5963  037076  001031                          BNE     3$              ;;IF NOT:  BR
5964  037100  132737  000100  001257          BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
5965  037106  001425                          BEQ     3$              ;;IF NOT:  BR
5966  037110  017600  000004                  MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
5967  037114  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
5968  037122  005737  001236          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
5969  037126  001375                          BNE     1$              ;;IF NOT:  WAIT
5970  037130  010037  001252                  MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
5971  037134  105720          2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
5972  037136  001376                          BNE     2$
5973  037140  163700  001252                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
5974  037144  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
5975  037146  010037  001254                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
5976  037152  012737  000004  001236          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
5977  037160  000413                          BR      5$
5978  037162  017637  000004  037206  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
5979  037170  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
5980  037176  013746  177776                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
5981  037202  004737  036550                  JSR     PC,$TYPE        ;;CALL TYPE MACRO
5982  037206  000000          4$:     .WORD   0
5983  037210          5$:
5984  037210  105737  037276          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
5985  037214  001416                          BEQ     12$             ;;IF NOT:  BR
5986  037216  005737  001256                  TST     $ENV            ;;RUNNING UNDER APT?
5987  037222  001413                          BEQ     12$             ;;IF NOT:  BR
5988  037224  005737  001236          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
5989  037230  001375                          BNE     11$             ;;IF NOT:  WAIT
5990  037232  017637  000004  001240          MOV     @4(SP),$FATAL   ;;GET ERROR #
5991  037240  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
5992  037246  005237  001236                  INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
```



```
5993  037252  105037  037276          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
5994  037256  105037  037275                  CLRB    $LFLG           ;;CLEAR LOG FLAG
5995  037262  105037  037274                  CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
5996  037266  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
5997  037270  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
5998  037272  000207                          RTS     PC              ;;RETURN
5999  037274     000  $MFLG:  .BYTE   0               ;;MESSG. FLAG
6000  037275     000  $LFLG:  .BYTE   0               ;;LOG FLAG
6001  037276     000  $FFLG:  .BYTE   0               ;;FATAL FLAG
6002          037300                  .EVEN
6003          000200          APTSIZE=200
6004          000001          APTENV=001
6005          000100          APTSPOOL=100
6006          000040          APTCSUP=040
6007                                  .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
6008
6009                                  ;;**************************************************************
6010                                  ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
6011                                  ;*OCTAL (ASCII) NUMBER AND TYPE IT.
6012                                  ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
6013                                  ;*CALL:
6014                                  ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
6015                                  ;*      TYPOS                   ;;CALL FOR TYPEOUT
6016                                  ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
6017                                  ;*      .BYTE   M               ;;M=1 OR 0
6018                                  ;*                                      ;;1=TYPE LEADING ZEROS
6019                                  ;*                                      ;;0=SUPPRESS LEADING ZEROS
6020                                  ;*
6021                                  ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
6022                                  ;*$TYPOS OR $TYPOC
6023                                  ;*CALL:
6024                                  ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
6025                                  ;*      TYPON                   ;;CALL FOR TYPEOUT
6026                                  ;*
6027                                  ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
6028                                  ;*CALL:
6029                                  ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
6030                                  ;*      TYPOC                   ;;CALL FOR TYPEOUT
6031
6032  037300  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
6033  037304  116637  000001  037523          MOVB    1(SP),$0FILL    ;;LOAD ZERO FILL SWITCH
6034  037312  112637  037525                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
6035  037316  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
6036  037322  000406                          BR      $TYPON
6037  037324  112737  000001  037523  $TYPOC: MOVB    #1,$0FILL       ;;SET THE ZERO FILL SWITCH
6038  037332  112737  000006  037525          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
6039  037340  112737  000005  037522  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
6040  037346  010346                          MOV     R3,-(SP)        ;;SAVE R3
6041  037350  010446                          MOV     R4,-(SP)        ;;SAVE R4
6042  037352  010546                          MOV     R5,-(SP)        ;;SAVE R5
6043  037354  113704  037525                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
6044  037360  005404                          NEG     R4
6045  037362  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
6046  037366  110437  037524                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
6047  037372  113704  037523                  MOVB    $0FILL,R4       ;;GET THE ZERO FILL SWITCH
6048  037376  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
```

```
 6049  037402  005003                  CLR     R3              ;;CLEAR THE OUTPUT WORD
 6050  037404  006105          1$:     ROL     R5              ;;ROTATE MSB INTO "C"
 6051  037406  000404                  BR      3$              ;;GO DO MSB
 6052  037410  006105          2$:     ROL     R5              ;;FORM THIS DIGIT
 6053  037412  006105                  ROL     R5
 6054  037414  006105                  ROL     R5
 6055  037416  010503                  MOV     R5,R3
 6056  037420  006103          3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
 6057  037422  105337  037524          DECB    $OMODE          ;;TYPE THIS DIGIT?
 6058  037426  100016                  BPL     7$              ;;BR IF NO
 6059  037430  042703  177770          BIC     #177770,R3      ;;GET RID OF JUNK
 6060  037434  001002                  BNE     4$              ;;TEST FOR 0
 6061  037436  005704                  TST     R4              ;;SUPPRESS THIS 0?
 6062  037440  001403                  BEQ     5$              ;;BR IF YES
 6063  037442  005204          4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
 6064  037444  052703  000060          BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
 6065  037450  052703  000040          BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
 6066  037454  110337  037520          MOVB    R3,8$           ;;SAVE FOR TYPING
 6067  037460  104401  037520          TYPE    ,8$             ;;GO TYPE THIS DIGIT
 6068  037464  105337  037522          DECB    $OCNT           ;;COUNT BY 1
 6069  037470  003347                  BGT     2$              ;;BR IF MORE TO DO
 6070  037472  002402                  BLT     6$              ;;BR IF DONE
 6071  037474  005204                  INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
 6072  037476  000744                  BR      2$              ;;GO DO THE LAST DIGIT
 6073  037500  012605          6$:     MOV     (SP)+,R5        ;;RESTORE R5
 6074  037502  012604                  MOV     (SP)+,R4        ;;RESTORE R4
 6075  037504  012603                  MOV     (SP)+,R3        ;;RESTORE R3
 6076  037506  016666  000002  000004  MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
 6077  037514  012616                  MOV     (SP)+,(SP)
 6078  037516  000002                  RTI                     ;;RETURN
 6079  037520     000          8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
 6080  037521     000                  .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
 6081  037522     000          $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
 6082  037523     000          $0FILL: .BYTE   0               ;;ZERO FILL SWITCH
 6083  037524  000000          $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
 6084                           .SBTTL  TTY INPUT ROUTINE
 6085
 6086                           ;;*****************************************************************
 6087                           .ENABL  LSB
 6088
 6089                           .DSABL  LSB
 6090
 6091
 6092                           ;;*****************************************************************
 6093                           ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 6094                           ;*CALL:
 6095                           ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
 6096                           ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
 6097                           ;*                              ;;WITH PARITY BIT STRIPPED OFF
 6098                           ;
 6099
 6100  037526  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
 6101  037530  016666  000004  000002  MOV     4(SP),2(SP)     ;;SAVE THE PS
 6102  037536  105777  141376  1$:     TSTB    @$TKS           ;;WAIT FOR
 6103  037542  100375                  BPL     1$              ;;A CHARACTER
 6104  037544  117766  141372  000004  MOVB    @$TKB,4(SP)     ;;READ THE TTY
```



```
 6105  037552  042766  177600  000004  BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
 6106  037560  026627  000004  000023  CMP     4(SP),#23       ;;IS IT A CONTROL-S?
 6107  037566  001013                  BNE     3$              ;;BRANCH IF NO
 6108  037570  105777  141344  2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
 6109  037574  100375                  BPL     2$              ;;LOOP UNTIL ITS THERE
 6110  037576  117746  141340          MOVB    @$TKB,-(SP)     ;;GET CHARACTER
 6111  037602  042716  177600          BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
 6112  037606  022627  000021          CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
 6113  037612  001366                  BNE     2$              ;;IF NOT DISCARD IT
 6114  037614  000750                  BR      1$              ;;YES, RESUME
 6115  037616  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
 6116  037624  002407                  BLT     4$              ;;BRANCH IF YES
 6117  037626  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
 6118  037634  003003                  BGT     4$              ;;BRANCH IF YES
 6119  037636  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
 6120  037644  000002          4$:     RTI                     ;;GO BACK TO USER
 6121                           ;;*****************************************************************
 6122                           ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
 6123                           ;*CALL:
 6124                           ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
 6125                           ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
 6126                           ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
 6127
 6128  037646  010346          $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
 6129  037650  005046                  CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
 6130  037652  012703  040102  1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
 6131  037656  022703  040112  2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
 6132  037662  101456                  BLOS    4$              ;;BR IF YES
 6133  037664  104406                  RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
 6134  037666  112613                  MOVB    (SP)+,(R3)      ;;GET CHARACTER
 6135  037670  122713  000177  10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
 6136  037674  001022                  BNE     5$              ;;BR IF NO
 6137  037676  005716                  TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
 6138  037700  001007                  BNE     6$              ;;BR IF NO
 6139  037702  112737  000134  040100  MOVB    #'\,9$          ;;TYPE A BACK SLASH
 6140  037710  104401  040100          TYPE    ,9$
 6141  037714  012716  177777          MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
 6142  037720  005303          6$:     DEC     R3              ;;BACKUP BY ONE
 6143  037722  020327  040102          CMP     R3,#$TTYIN      ;;STACK EMPTY?
 6144  037726  103434                  BLO     4$              ;;BR IF YES
 6145  037730  111337  040100          MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
 6146  037734  104401  040100          TYPE    ,9$             ;;GO TYPE
 6147  037740  000746                  BR      2$              ;;GO READ ANOTHER CHAR.
 6148  037742  005716          5$:     TST     (SP)            ;;RUBOUT KEY SET?
 6149  037744  001406                  BEQ     7$              ;;BR IF NO
 6150  037746  112737  000134  040100  MOVB    #'\,9$          ;;TYPE A BACK SLASH
 6151  037754  104401  040100          TYPE    ,9$
 6152  037760  005016                  CLR     (SP)            ;;CLEAR THE RUBOUT KEY
 6153  037762  122713  000025  7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
 6154  037766  001003                  BNE     8$              ;;BR IF NO
 6155  037770  104401  040112          TYPE    ,$CNTLU         ;;TYPE A CONTROL "U"
 6156  037774  000726                  BR      1$              ;;GO START OVER
 6157  037776  122713  000022  8$:     CMPB    #22,(R3)        ;;IS CHARACTER A "^R"?
 6158  040002  001011                  BNE     3$              ;;BRANCH IF NO
 6159  040004  105013                  CLRB    (R3)            ;;CLEAR THE CHARACTER
 6160  040006  104401  001207          TYPE    ,$CRLF          ;;TYPE A "CR" & "LF"
```

```
  6161  040012  104401  040102                TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
  6162  040016  000717                        BR      2$              ;;GO PICKUP ANOTHER CHACTER
  6163  040020  104401  001206          4$:   TYPE    ,$QUES          ;;TYPE A '?'
  6164  040024  000712                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
  6165  040026  111337  040100          3$:   MOVB    (R3),9$         ;;ECHO THE CHARACTER
  6166  040032  104401  040100                TYPE    ,9$
  6167  040036  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
  6168  040042  001305                        BNE     2$              ;;LOOP IF NOT RETURN
  6169  040044  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
  6170  040050  104401  001210                TYPE    ,$LF            ;;TYPE A LINE FEED
  6171  040054  005726                        TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
  6172  040056  012603                        MOV     (SP)+,R3        ;;RESTORE R3
  6173  040060  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
  6174  040062  016666  000004  000002        MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
  6175  040070  012766  040102  000004        MOV     #$TTYIN,4(SP)
  6176  040076  000002                        RTI                     ;;RETURN
  6177  040100     000                  9$:   .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
  6178  040101     000                        .BYTE   0               ;;TERMINATOR
  6179  040102  000010                $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
  6180  040112  052536  005015     000 $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
  6181  040117     136  006507  000012 $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
  6182  040124  005015  053523  020122 $MSWR:  .ASCIZ  <15><12>/SWR = /
  6183  040132  020075     000
  6184  040135     040  047040  053505 $MNEW:  .ASCIZ  /  NEW = /
  6185  040142  036440  000040
  6186                                .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
  6187
  6188                                ;;*************************************************************
  6189                                ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
  6190                                ;*CHANGE IT TO BINARY.
  6191                                ;*THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
  6192                                ;*OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
  6193                                ;*FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
  6194                                ;*THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
  6195                                ;*CALL:
  6196                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
  6197                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
  6198                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
  6199
  6200  040146  011646                $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
  6201  040150  016666  000004  000002        MOV     4(SP),2(SP)     ;;INPUT NUMBER
  6202  040156  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
  6203  040160  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
  6204  040162  010246                        MOV     R2,-(SP)        ;;PUSH R2 ON STACK
  6205  040164  104407                  1$:   RDLIN                   ;;READ AN ASCIZ LINE
  6206  040166  012600                        MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
  6207  040170  010037  040274                MOV     R0,5$           ;;AND SAVE IT
  6208  040174  005001                        CLR     R1              ;;CLEAR DATA WORD
  6209  040176  005002                        CLR     R2
  6210  040200  112046                  2$:   MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
  6211  040202  001420                        BEQ     3$              ;;IF ZERO GET OUT
  6212  040204  122716  000060                CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
  6213  040210  003026                        BGT     4$              ;;IS AN OCTAL DIGIT
  6214  040212  122716  000067                CMPB    #'7,(SP)
  6215  040216  002423                        BLT     4$
  6216  040220  006301                        ASL     R1              ;;*2
```



```
  6217  040222  006102                        ROL     R2
  6218  040224  006301                        ASL     R1              ;;*4
  6219  040226  006102                        ROL     R2
  6220  040230  006301                        ASL     R1              ;;*8
  6221  040232  006102                        ROL     R2
  6222  040234  042716  177770                BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
  6223  040240  062601                        ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
  6224  040242  000756                        BR      2$              ;;LOOP
  6225  040244  005726                  3$:   TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
  6226  040246  010166  000012                MOV     R1,12(SP)       ;;SAVE THE RESULT
  6227  040252  010237  040304                MOV     R2,$HIOCT
  6228  040256  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
  6229  040260  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
  6230  040262  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
  6231  040264  000002                        RTI                     ;;RETURN
  6232  040266  005726                  4$:   TST     (SP)+           ;;CLEAN PARTIAL FROM STACK

  6233  040270  105010                        CLRB    (R0)            ;;SET A TERMINATOR
  6234  040272  104401                        TYPE                    ;;TYPE UP THRU THE BAD CHAR.
  6235  040274  000000                  5$:   .WORD   0
  6236  040276  104401  001206                TYPE    ,$QUES          ;;"?" "CR" & "LF"
  6237  040302  000730                        BR      1$              ;;TRY AGAIN
  6238  040304  000000                $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
  6239                                .SBTTL  TRAP DECODER
  6240
  6241                                ;;*************************************************************
  6242                                ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
  6243                                ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
  6244                                ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
  6245                                ;*GO TO THAT ROUTINE.
  6246
  6247  040306  010046                $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
  6248  040310  016600  000002                MOV     2(SP),R0        ;;GET TRAP ADDRESS
  6249  040314  005740                        TST     -(R0)           ;;BACKUP BY 2
  6250  040316  111000                        MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
  6251  040320  006300                        ASL     R0              ;;POSITION FOR INDEXING
  6252  040322  016000  040342                MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
  6253  040326  000200                        RTS     R0              ;;GO TO ROUTINE
  6254
  6255
  6256                                ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
  6257
  6258  040330  011646                $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
  6259  040332  016666  000004  000002        MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
  6260  040340  000002                        RTI                     ;;RESTORE THE PSW
  6261
  6262                                .SBTTL  TRAP TABLE
  6263
  6264                                ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
  6265                                ;*BY THE "TRAP" INSTRUCTION.
  6266
  6267                                ;       ROUTINE
  6268                                ;       -------
  6269  040342  040330                $TRPAD: .WORD   $TRAP2
  6270  040344  036550                        $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
  6271  040346  037324                        $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
  6272  040350  037300                        $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
```

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  6273  040352  037340                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
  6274  040354  036324                          $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
  6275
  6276
  6277  040356  037526                          $RDCHR  ;;CALL=RDCHR    TRAP+6(104406)  TTY TYPEIN CHARACTER ROUTINE
  6278  040360  037646                          $RDLIN  ;;CALL=RDLIN    TRAP+7(104407)  TTY TYPEIN STRING ROUTINE
  6279  040362  040146                          $RDOCT  ;;CALL=RDOCT    TRAP+10(104410) READ AN OCTAL NUMBER FROM TTY
  6280                                  .SBTTL  POWER DOWN AND UP ROUTINES
  6281
  6282                                  ;;**************************************************************
  6283                                  ;POWER DOWN ROUTINE
  6284  040364  012737  040524  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
  6285  040372  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
  6286  040400  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
  6287  040402  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
  6288  040404  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
  6289  040406  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
  6290  040410  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
  6291  040412  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
  6292  040414  017746  140514                  MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
  6293  040420  010637  040530                  MOV     SP,$SAVR6       ;;SAVE SP
  6294  040424  012737  040436  000024          MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
  6295  040432  000000                          HALT
  6296  040434  000776                          BR      .-2             ;;HANG UP
  6297
  6298                                  ;;**************************************************************
  6299                                  ;POWER UP ROUTINE
  6300  040436  012737  040524  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
  6301  040444  013706  040530                  MOV     $SAVR6,SP       ;;GET SP
  6302  040450  005037  040530                  CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
  6303  040454  005237  040530          1$:     INC     $SAVR6          ;;WAIT FOR THE INC
  6304  040460  001375                          BNE     1$              ;;OF  WORD
  6305  040462  012677  140446                  MOV     (SP)+,@SWR      ;;POP STACK INTO @SWR
  6306  040466  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
  6307  040470  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
  6308  040472  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
  6309  040474  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
  6310  040476  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
  6311  040500  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
  6312  040502  012737  040364  000024          MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
  6313  040510  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;PRIO:7
  6314  040516  104401                          TYPE                    ;REPORT THE POWER FAILURE
  6315  040520  040532                  $PWRMG: .WORD   $POWER          ;;POWER FAIL MESSAGE POINTER
  6316  040522  000002                          RTI
  6317  040524  000000                  $ILLUP: HALT                    ;;THE POWER UP SEQUENCE WAS STARTED
  6318  040526  000776                          BR      .-2             ;; BEFORE THE POWER DOWN WAS COMPLETE
  6319  040530  000000                  $SAVR6: 0                       ;;PUT THE SP HERE
  6320  040532  005015  047520  042527  $POWER: .ASCIZ  <15><12>"POWER"
  6321  040540  000122
  6322                                          .EVEN
  6323                                  ;;**************************************************************
  6324                                  ;;**************************************************************
  6325                                  ;;**************************************************************
  6326
  6327  040542  005015  005015  040515  MSG1:   .ASCIZ<15><12><15><12>*MAINDEC-11-DQKAA-1  11/6X CACHE DIAGNOSTIC*<15><12><15><1
  6328  040550  047111  042504  026503
```



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  6329  040556  030461  042055  045521
  6330  040564  040501  030455  020040
  6331  040572  030461  033057  020130
  6332  040600  040503  044103  020105
  6333  040606  044504  043501  047516
  6334  040614  052123  041511  005015
  6335  040622  005015     000
  6336  040625     015  050012  053517  MSG2:   .ASCIZ  <15><12>*POWER MACHINE DOWN AND THEN UP*<15><12>
  6337  040632  051105  046440  041501
  6338  040640  044510  042516  042040
  6339  040646  053517  020116  047101
  6340  040654  020104  044124  047105
  6341  040662  052440  006520  000012
  6342  040670  005015  054524  042520  MSG3:   .ASCII<CR><LF>*TYPE WHICH DEVICE SHOULD BE USED*<CR><LF>
  6343  040676  053440  044510  044103
  6344  040704  042040  053105  041511
  6345  040712  020105  044123  052517
  6346  040720  042114  041040  020105
  6347  040726  051525  042105  005015
  6348  040734  030012  055440  040503          .ASCII<LF>*0 [CARRIAGE RETURN]-UNIBUS EXERCISOR (M7855)*<CR><LF>
  6349  040742  051122  040511  042507
  6350  040750  051040  052105  051125
  6351  040756  056516  052455  044516
  6352  040764  052502  020123  054105
  6353  040772  051105  044503  047523
  6354  041000  020122  046450  034067
  6355  041006  032465  006451     012
  6356  041013     061  055440  040503          .ASCII*1 [CARRIAGE RETURN]-BUS TESTER (OLD)*<CR><LF>
  6357  041020  051122  040511  042507
  6358  041026  051040  052105  051125
  6359  041034  056516  041055  051525
  6360  041042  052040  051505  042524
  6361  041050  020122  047450  042114
  6362  041056  006451     012
  6363  041061     062  055440  040503          .ASCII*2 [CARRIAGE RETURN]-RK05*<CR><LF>
  6364  041066  051122  040511  042507
  6365  041074  051040  052105  051125
  6366  041102  056516  051055  030113
  6367  041110  006465     012
  6368  041113     063  055440  040503          .ASCII*3 [CARRIAGE RETURN]-RP03*<CR><LF>
  6369  041120  051122  040511  042507
  6370  041126  051040  052105  051125
  6371  041134  056516  051055  030120
  6372  041142  006463     012
  6373  041145     064  055440  040503          .ASCIZ*4 [CARRIAGE RETURN]-TU10*<CR><LF><CR><LF>
  6374  041152  051122  040511  042507
  6375  041160  051040  052105  051125
  6376  041166  056516  052055  030525
  6377  041174  006460  006412  000012
  6378  041202  005015  020077  044440  MSG4:   .ASCIZ<CR><LF>*?  INVALID ENTRY, TRY AGAIN*<CR><LF>
  6379  041210  053116  046101  042111
  6380  041216  042440  052116  054522
  6381  041224  020054  051124  020131
  6382  041232  043501  044501  006516
  6383  041240  000012
  6384  041242  005015  052040  050131  MSG5:   .ASCIZ<CR><LF>* TYPE THE UBE'S DATA BUFFER ADDRESS*<CR><LF>
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6385  041250  020105  044124  020105
6386  041256  041125  023505  020123
6387  041264  040504  040524  041040
6388  041272  043125  042506  020122
6389  041300  042101  051104  051505
6390  041306  006523  000012
6391  041312  005015  042040  053105  MSG6:   .ASCII<CR><LF>* DEVICE DOES NOT RESPOND*<CR><LF>
6392  041320  041511  020105  047504
6393  041326  051505  047040  052117
6394  041334  051040  051505  047520
6395  041342  042116  005015
6396  041346  020040  020040  020040          .ASCIZ*          REFERENCE TO IT TRAPS TO 4*<CR><LF>
6397  041354  020040  051040  043105
6398  041362  051105  047105  042503
6399  041370  052040  020117  052111
6400  041376  052040  040522  051520
6401  041404  052040  020117  006464
6402  041412  000012
6403  041414  005015  044127  041511  MSG7:   .ASCII<CR><LF>*WHICH DRIVE SHOULD BE USED?*<CR><LF>
6404  041422  020110  051104  053111
6405  041430  020105  044123  052517
6406  041436  042114  041040  020105
6407  041444  051525  042105  006477
6408  041452     012
6409  041453     124  050131  020105          .ASCIZ*TYPE 0-7<CARRIAGE RETURN>*<CR><LF>
6410  041460  026460  036067  040503
6411  041466  051122  040511  042507
6412  041474  051040  052105  051125
6413  041502  037116  005015     000
6414  041507     015  052412  044516  MSG10:  .ASCIZ<CR><LF>*UNIT NOT SELECTED PROPERLY*<CR><LF>
6415  041514  020124  047516  020124
6416  041522  042523  042514  052103
6417  041530  042105  050040  047522
6418  041536  042520  046122  006531
6419  041544  000012
6420  041546  005015  047125  052111  MSG11:  .ASCIZ<CR><LF>*UNIT WRITE LOCK ON, SHOULD BE OFF*<CR><LF>
6421  041554  053440  044522  042524
6422  041562  046040  041517  020113
6423  041570  047117  020054  044123
6424  041576  052517  042114  041040
6425  041604  020105  043117  006506
6426  041612  000012
6427  041614  005015  042504  044526  MSG12:  .ASCIZ<CR><LF>*DEVICE ERROR BIT SET*<CR><LF>
6428  041622  042503  042440  051122
6429  041630  051117  041040  052111
6430  041636  051440  052105  005015
6431  041644     000
6432  041645     015  042012  053105  MSG13:  .ASCIZ<CR><LF>*DEVICE RDY BIT DOES NOT SET*<CR><LF>
6433  041652  041511  020105  042122
6434  041660  020131  044502  020124
6435  041666  047504  051505  047040
6436  041674  052117  051440  052105
6437  041702  005015     000
6438  041705     015  043012  051125  MSG14:  .ASCIZ<CR><LF>*FURTHER NPR DEVICE TESTS ABORTED*<CR><LF>
6439  041712  044124  051105  047040
6440  041720  051120  042040  053105
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6441  041726  041511  020105  042524
6442  041734  052123  020123  041101
6443  041742  051117  042524  006504
6444  041750  000012
6445
6446  041752  051105  047522  035122  EM1:    .ASCIZ*ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE*
6447  041760  052440  042516  050130
6448  041766  041505  042524  020104
6449  041774  040520  044522  054524
6450  042002  042440  051122  051117
6451  042010  044440  020116  040502
6452  042016  045503  047111  020107
6453  042024  052123  051117  000105
6454  042032  051105  047522  035122  EM2:    .ASCIZ*ERROR: UNEXPECTED PARITY ERROR IN CACHE TAG*
6455  042040  052440  042516  050130
6456  042046  041505  042524  020104
6457  042054  040520  044522  054524
6458  042062  042440  051122  051117
6459  042070  044440  020116  040503
6460  042076  044103  020105  040524
6461  042104  000107
6462  042106  051105  047522  035122  EM3:    .ASCIZ*ERROR: UNEXPECTED PARITY ERROR IN CACHE DATA LOW*
6463  042114  052440  042516  050130
6464  042122  041505  042524  020104
6465  042130  040520  044522  054524
6466  042136  042440  051122  051117
6467  042144  044440  020116  040503
6468  042152  044103  020105  040504
6469  042160  040524  046040  053517
6470  042166     000
6471  042167     105  051122  051117  EM4:    .ASCIZ*ERROR: UNEXPECTED PARITY ERROR IN CACHE DATA HIGH*
6472  042174  020072  047125  054105
6473  042202  042520  052103  042105
6474  042210  050040  051101  052111
6475  042216  020131  051105  047522
6476  042224  020122  047111  041440
6477  042232  041501  042510  042040
6478  042240  052101  020101  044510
6479  042246  044107     000
6480  042251     106  052101  046101  EM5:    .ASCIZ*FATAL ERROR: CACHE CONTROL REG HELD WRONG DATA*
6481  042256  042440  051122  051117
6482  042264  020072  040503  044103
6483  042272  020105  047503  052116
6484  042300  047522  020114  042522
6485  042306  020107  042510  042114
6486  042314  053440  047522  043516
6487  042322  042040  052101  000101
6488  042330  040506  040524  020114  EM6:    .ASCIZ*FATAL ERROR: HIT/MISS REG HELD WRONG DATA*
6489  042336  051105  047522  035122
6490  042344  044040  052111  046457
6491  042352  051511  020123  042522
6492  042360  020107  042510  042114
6493  042366  053440  047522  043516
6494  042374  042040  052101  000101
6495  042402  051105  047522  035122  EM7:    .ASCIZ*ERROR: DATA CACHED ON DATOB TO NO 'HIT' ADDR.*
6496  042410  042040  052101  020101
```

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6497  042416  040503  044103  042105
6498  042424  047440  020116  040504
6499  042432  047524  020102  047524
6500  042440  047040  020117  044047
6501  042446  052111  020047  042101
6502  042454  051104  000056
6503  042460  051105  047522  035122  EM10:   .ASCIZ*ERROR: DATA NOT CACHED ON DATOB TO A 'HIT' ADDR.*
6504  042466  042040  052101  020101
6505  042474  047516  020124  040503
6506  042502  044103  042105  047440
6507  042510  020116  040504  047524
6508  042516  020102  047524  040440
6509  042524  023440  044510  023524
6510  042532  040440  042104  027122
6511  042540      000
6512  042541      105  051122  051117  EM11:   .ASCIZ*ERROR: CACHE DID NOT CONTAIN PROPER DATA ON DATOB*
6513  042546  020072  040503  044103
6514  042554  020105  044504  020104
6515  042562  047516  020124  047503
6516  042570  052116  044501  020116
6517  042576  051120  050117  051105
6518  042604  042040  052101  020101
6519  042612  047117  042040  052101
6520  042620  041117      000
6521  042623      105  051122  051117  EM12:   .ASCIZ*ERROR: FORCE MISS BIT FAILED TO CAUSE MISS*
6522  042630  020072  047506  041522
6523  042636  020105  044515  051523
6524  042644  041040  052111  043040
6525  042652  044501  042514  020104
6526  042660  047524  041440  052501
6527  042666  042523  046440  051511
6528  042674  000123
6529  042676  051105  047522  035122  EM14:   .ASCIZ*ERROR: ADDRESS COULD NOT BE MADE A 'HIT' AFTER DATO TO IT*
6530  042704  040440  042104  042522
6531  042712  051523  041440  052517
6532  042720  042114  047040  052117
6533  042726  041040  020105  040515
6534  042734  042504  040440  023440
6535  042742  044510  023524  040440
6536  042750  052106  051105  042040
6537  042756  052101  020117  047524
6538  042764  044440  000124
6539  042770  051105  047522  035122  EM16:   .ASCIZ*ERROR: UNEXPECTED TRAP TO VECTOR 4*
6540  042776  052440  042516  050130
6541  043004  041505  042524  020104
6542  043012  051124  050101  052040
6543  043020  020117  042526  052103
6544  043026  051117  032040      000
6545  043033      105  051122  051117  EM17:   .ASCIZ*ERROR: FORCE MISS DID NOT PREVENT CACHE TRACKING*
6546  043040  020072  047506  041522
6547  043046  020105  044515  051523
6548  043054  042040  042111  047040
6549  043062  052117  050040  042522
6550  043070  042526  052116  041440
6551  043076  041501  042510  052040
6552  043104  040522  045503  047111
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6553  043112  000107
6554  043114  051105  047522  035122  EM20:   .ASCIZ*ERROR: PHYSICAL ADDRESS LINES ERROR*<15><12>*        ADDRESS HELD WRONG D
6555  043122  050040  054510  044523
6556  043130  040503  020114  042101
6557  043136  051104  051505  020123
6558  043144  044514  042516  020123
6559  043152  051105  047522  006522
6560  043160  020012  020040  020040
6561  043166  020040  040440  042104
6562  043174  042522  051523  044040
6563  043202  046105  020104  051127
6564  043210  047117  020107  040504
6565  043216  040524      000
6566  043221      105  051122  051117  EM21:   .ASCIZ*ERROR: TRAP TO VECTOR 4  WHEN TESTING PHYSICAL ADDRESS LINES*
6567  043226  020072  051124  050101
6568  043234  052040  020117  042526
6569  043242  052103  051117  032040
6570  043250  020040  044127  047105
6571  043256  052040  051505  044524
6572  043264  043516  050040  054510
6573  043272  044523  040503  020114
6574  043300  042101  051104  051505
6575  043306  020123  044514  042516
6576  043314  000123
6577  043316  051105  047522  035122  EM22:   .ASCIZ*ERROR:TEST OF ADDRESS COMPARATOR FAILED TO BE A MISS WHEN*
6578  043324  042524  052123  047440
6579  043332  020106  042101  051104
6580  043340  051505  020123  047503
6581  043346  050115  051101  052101
6582  043354  051117  043040  044501
6583  043362  042514  020104  047524
6584  043370  041040  020105  020101
6585  043376  044515  051523  053440
6586  043404  042510  000116
6587  043410  051105  047522  035122  EM23:   .ASCIZ*ERROR:TEST OF ADDRESS COMPARATOR FAILED TO BE A HIT WHEN*
6588  043416  042524  052123  047440
6589  043424  020106  042101  051104
6590  043432  051505  020123  047503
6591  043440  050115  051101  052101
6592  043446  051117  043040  044501
6593  043454  042514  020104  047524
6594  043462  041040  020105  020101
6595  043470  044510  020124  044127
6596  043476  047105      000
6597  043501      105  051122  051117  EM24:   .ASCIZ*ERROR:FORCE MISS DID NOT INHIBIT PARITY ERRORS*
6598  043506  043072  051117  042503
6599  043514  046440  051511  020123
6600  043522  044504  020104  047516
6601  043530  020124  047111  044510
6602  043536  044502  020124  040520
6603  043544  044522  054524  042440
6604  043552  051122  051117  000123
6605  043560  051105  047522  035122  EM25:   .ASCIZ*ERROR:DATO TO I/O ADDRESS WRITTEN IN CACHE*
6606  043566  040504  047524  052040
6607  043574  020117  027511  020117
6608  043602  042101  051104  051505
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6609  043610  020123  051127  052111
6610  043616  042524  020116  047111
6611  043624  041440  041501  042510
6612  043632     000
6613  043633     105  051122  051117  EM26:   .ASCIZ*ERROR:CACHE CONTROL REG HELD WRONG DATA*
6614  043640  041472  041501  042510
6615  043646  041440  047117  051124
6616  043654  046117  051040  043505
6617  043662  044040  046105  020104
6618  043670  051127  047117  020107
6619  043676  040504  040524     000
6620  043703     105  051122  051117  EM27:   .ASCII*ERROR:TEST OF TAG PARITY GENERATOR/CHECKER FAILED*<15><12>
6621  043710  052072  051505  020124
6622  043716  043117  052040  043501
6623  043724  050040  051101  052111
6624  043732  020131  042507  042516
6625  043740  040522  047524  027522
6626  043746  044103  041505  042513
6627  043754  020122  040506  046111
6628  043762  042105  005015
6629  043766  020040  020040  020040          .ASCIZ*      DID NOT GET PARITY TRAP FROM TAG FIELD WHEN WROTE WRONG PARITY*
6630  043774  044504  020104  047516
6631  044002  020124  042507  020124
6632  044010  040520  044522  054524
6633  044016  052040  040522  020120
6634  044024  051106  046517  052040
6635  044032  043501  043040  042511
6636  044040  042114  053440  042510
6637  044046  020116  051127  052117
6638  044054  020105  051127  047117
6639  044062  020107  040520  044522
6640  044070  054524     000
6641  044073     105  051122  051117  EM31:   .ASCII*ERROR:TEST OF TAG PARITY GENERATOR/CHECKER FAILED*<15><12>
6642  044100  052072  051505  020124
6643  044106  043117  052040  043501
6644  044114  050040  051101  052111
6645  044122  020131  042507  042516
6646  044130  040522  047524  027522
6647  044136  044103  041505  042513
6648  044144  020122  040506  046111
6649  044152  042105  005015
6650  044156  020040  020040  020040          .ASCIZ*      TAG FIELD HELD WRONG DATA ON PARITY TRAP*
6651  044164  040524  020107  044506
6652  044172  046105  020104  042510
6653  044200  042114  053440  047522
6654  044206  043516  042040  052101
6655  044214  020101  047117  050040
6656  044222  051101  052111  020131
6657  044230  051124  050101     000
6658  044235     105  051122  051117  EM32:   .ASCII*ERROR:TEST OF TAG PARITY GENERATOR/CHECKER FAILED*<15><12>
6659  044242  052072  051505  020124
6660  044250  043117  052040  043501
6661  044256  050040  051101  052111
6662  044264  020131  042507  042516
6663  044272  040522  047524  027522
6664  044300  044103  041505  042513
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6665  044306  020122  040506  046111
6666  044314  042105  005015
6667  044320  020040  020040  020040          .ASCIZ*      PARITY ERROR IN HIGH DATA BYTE*
6668  044326  040520  044522  054524
6669  044334  042440  051122  051117
6670  044342  044440  020116  044510
6671  044350  044107  042040  052101
6672  044356  020101  054502  042524
6673  044364     000
6674  044365     105  051122  051117  EM33:   .ASCII*ERROR:TEST OF TAG PARITY GENERATOR/CHECKER FAILED*<15><12>
6675  044372  052072  051505  020124
6676  044400  043117  052040  043501
6677  044406  050040  051101  052111
6678  044414  020131  042507  042516
6679  044422  040522  047524  027522
6680  044430  044103  041505  042513
6681  044436  020122  040506  046111
6682  044444  042105  005015
6683  044450  020040  020040  020040          .ASCIZ*      PARITY ERROR IN LOW DATA BYTE*
6684  044456  040520  044522  054524
6685  044464  042440  051122  051117
6686  044472  044440  020116  047514
6687  044500  020127  040504  040524
6688  044506  041040  052131  000105
6689  044514  051105  047522  035122  EM34:   .ASCII*ERROR:TEST OF TAG PARITY GENERATOR/CHECKER FAILED*<15><12>
6690  044522  042524  052123  047440
6691  044530  020106  040524  020107
6692  044536  040520  044522  054524
6693  044544  043440  047105  051105
6694  044552  052101  051117  041457
6695  044560  042510  045503  051105
6696  044566  043040  044501  042514
6697  044574  006504     012
6698  044577     040  020040  020040          .ASCIZ*      PARITY ERROR IN TAG FIELD*
6699  044604  050040  051101  052111
6700  044612  020131  051105  047522
6701  044620  020122  047111  052040
6702  044626  043501  043040  042511
6703  044634  042114     000
6704  044637     105  051122  051117  EM35:   .ASCII*ERROR:TEST OF DATA PARITY GENERATOR/CHECKER FAILED*<15><12>
6705  044644  052072  051505  020124
6706  044652  043117  042040  052101
6707  044660  020101  040520  044522
6708  044666  054524  043440  047105
6709  044674  051105  052101  051117
6710  044702  041457  042510  045503
6711  044710  051105  043040  044501
6712  044716  042514  006504     012
6713  044723     040  020040  020040          .ASCIZ*      NO PARITY TRAP WHEN WROTE WRONG PARITY*
6714  044730  047040  020117  040520
6715  044736  044522  054524  052040
6716  044744  040522  020120  044127
6717  044752  047105  053440  047522
6718  044760  042524  053440  047522
6719  044766  043516  050040  051101
6720  044774  052111  000131
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6721  045000  051105  047522  035122  EM36:   .ASCII*ERROR:TEST OF DATA PARITY GENERATOR/CHECKER FAILED*<15><12>
6722  045006  042524  052123  047440
6723  045014  020106  040504  040524
6724  045022  050040  051101  052111
6725  045030  020131  042507  042516
6726  045036  040522  047524  027522
6727  045044  044103  041505  042513
6728  045052  020122  040506  046111
6729  045060  042105  005015
6730  045064  020040  020040  020040          .ASCIZ*       NO PARITY TRAP FROM LOW BYTE WHEN WROTE WRONG PARITY*
6731  045072  047516  050040  051101
6732  045100  052111  020131  051124
6733  045106  050101  043040  047522
6734  045114  020115  047514  020127
6735  045122  054502  042524  053440
6736  045130  042510  020116  051127
6737  045136  052117  020105  051127
6738  045144  047117  020107  040520
6739  045152  044522  054524     000
6740  045157     105  051122  051117  EM37:   .ASCII*ERROR:TEST OF DATA PARITY GENERATOR/CHECKER FAILED*<15><12>
6741  045164  052072  051505  020124
6742  045172  043117  042040  052101
6743  045200  020101  040520  044522
6744  045206  054524  043440  047105
6745  045214  051105  052101  051117
6746  045222  041457  042510  045503
6747  045230  051105  043040  044501
6748  045236  042514  006504     012
6749  045243     040  020040  020040          .ASCIZ*       NO PARITY TRAP FROM HIGH BYTE WHEN WROTE WRONG PARITY*
6750  045250  047040  020117  040520
6751  045256  044522  054524  052040
6752  045264  040522  020120  051106
6753  045272  046517  044040  043511
6754  045300  020110  054502  042524
6755  045306  053440  042510  020116
6756  045314  051127  052117  020105
6757  045322  051127  047117  020107
6758  045330  040520  044522  054524
6759  045336     000
6760  045337     105  051122  051117  EM40:   .ASCII*ERROR:TEST OF DATA PARITY GENERATOR/CHECKER FAILED*<15><12>
6761  045344  052072  051505  020124
6762  045352  043117  042040  052101
6763  045360  020101  040520  044522
6764  045366  054524  043440  047105
6765  045374  051105  052101  051117
6766  045402  041457  042510  045503
6767  045410  051105  043040  044501
6768  045416  042514  006504     012
6769  045423     040  020040  020040          .ASCIZ*       PARITY ERROR IN LOW BYTE*
6770  045430  050040  051101  052111
6771  045436  020131  051105  047522
6772  045444  020122  047111  046040
6773  045452  053517  041040  052131
6774  045460  000105
6775  045462  051105  047522  035122  EM41:   .ASCII*ERROR:TEST OF DATA PARITY GENERATOR/CHECKER FAILED*<15><12>
6776  045470  042524  052123  047440
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6777  045476  020106  040504  040524
6778  045504  050040  051101  052111
6779  045512  020131  042507  042516
6780  045520  040522  047524  027522
6781  045526  044103  041505  042513
6782  045534  020122  040506  046111
6783  045542  042105  005015
6784  045546  020040  020040  020040          .ASCIZ*       PARITY ERROR IN HIGH BYTE*
6785  045554  040520  044522  054524
6786  045562  042440  051122  051117
6787  045570  044440  020116  044510
6788  045576  044107  041040  052131
6789  045604  000105
6790  045606  051105  047522  035122  EM42:   .ASCIZ*ERROR:NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PARITY*
6791  045614  047516  050040  051101
6792  045622  052111  020131  051124

6793  045630  050101  043040  047522
6794  045636  020115  047514  020103
6795  045644  051127  052111  042524
6796  045652  020116  044527  044124
6797  045660  053440  047522  043516
6798  045666  050040  051101  052111
6799  045674  000131
6800  045676  051105  047522  035122  EM43:   .ASCIZ*ERROR: ADDRESS COULD NOT BE MADE A HIT*
6801  045704  040440  042104  042522
6802  045712  051523  041440  052517
6803  045720  042114  047040  052117
6804  045726  041040  020105  040515
6805  045734  042504  040440  044040
6806  045742  052111     000
6807  045745     105  051122  051117  EM44:   .ASCIZ*ERROR: ADDRESS NOT INVALIDATED BY PARITY TRAP*
6808  045752  020072  042101  051104
6809  045760  051505  020123  047516
6810  045766  020124  047111  040526
6811  045774  044514  040504  042524
6812  046002  020104  054502  050040
6813  046010  051101  052111  020131
6814  046016  051124  050101     000
6815  046023     105  051122  051117  EM45:   .ASCIZ*ERROR: TAG PARITY ERROR WHEN TESTING TAG P BIT*
6816  046030  020072  040524  020107
6817  046036  040520  044522  054524
6818  046044  042440  051122  051117
6819  046052  053440  042510  020116
6820  046060  042524  052123  047111
6821  046066  020107  040524  020107
6822  046074  020120  044502  000124
6823  046102  051105  047522  035122  EM46:   .ASCIZ*ERROR: LOW BYTE PARITY ERROR WHEN TESTING TAG PARITY BIT*
6824  046110  046040  053517  041040
6825  046116  052131  020105  040520
6826  046124  044522  054524  042440
6827  046132  051122  051117  053440
6828  046140  042510  020116  042524
6829  046146  052123  047111  020107
6830  046154  040524  020107  040520
6831  046162  044522  054524  041040
6832  046170  052111     000
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6833  046173     105  051122  051117  EM47:   .ASCIZ*ERROR: HIGH BYTE PARITY ERROR WHEN TESTING TAG P BIT*
6834  046200  020072  044510  044107
6835  046206  041040  052131  020105
6836  046214  040520  044522  054524
6837  046222  042440  051122  051117
6838  046230  053440  042510  020116
6839  046236  042524  052123  047111
6840  046244  020107  040524  020107
6841  046252  020120  044502  000124
6842  046260  051105  047522  035122  EM50:   .ASCIZ*ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA P BIT*
6843  046266  044040  043511  020110
6844  046274  054502  042524  050040
6845  046302  051101  052111  020131
6846  046310  051105  047522  020122
6847  046316  044127  047105  052040
6848  046324  051505  044524  043516
6849  046332  042040  052101  020101
6850  046340  020120  044502  000124
6851  046346  051105  047522  035122  EM51:   .ASCIZ*ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA P BIT*
6852  046354  046040  053517  041040
6853  046362  052131  020105  040520
6854  046370  044522  054524  042440
6855  046376  051122  051117  053440
6856  046404  042510  020116  042524
6857  046412  052123  047111  020107
6858  046420  040504  040524  050040
6859  046426  041040  052111     000
6860  046433     105  051122  051117  EM52:   .ASCIZ*ERROR: TAG PARITY ERROR WHEN TESTING TAG ADDRESS BITS*
6861  046440  020072  040524  020107
6862  046446  040520  044522  054524
6863  046454  042440  051122  051117
6864  046462  053440  042510  020116
6865  046470  042524  052123  047111
6866  046476  020107  040524  020107
6867  046504  042101  051104  051505
6868  046512  020123  044502  051524
6869  046520     000
6870  046521     105  051122  051117  EM53:   .ASCIZ*ERROR: LOW BYTE PARITY ERROR WHEN TESTING TAG ADDRESS BITS*
6871  046526  020072  047514  020127
6872  046534  054502  042524  050040
6873  046542  051101  052111  020131
6874  046550  051105  047522  020122
6875  046556  044127  047105  052040
6876  046564  051505  044524  043516
6877  046572  052040  043501  040440
6878  046600  042104  042522  051523
6879  046606  041040  052111  000123
6880  046614  051105  047522  035122  EM54:   .ASCIZ*ERROR: HIGH BYTE PARITY ERROR WHEN TESTING TAG ADDRESS BITS*
6881  046622  044040  043511  020110
6882  046630  054502  042524  050040
6883  046636  051101  052111  020131
6884  046644  051105  047522  020122
6885  046652  044127  047105  052040
6886  046660  051505  044524  043516
6887  046666  052040  043501  040440
6888  046674  042104  042522  051523
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6889  046702  041040  052111  000123
6890  046710  051105  047522  035122  EM55:   .ASCII*ERROR: TEST OF TAG ADDRESS BITS FAILED*<15><12>
6891  046716  052040  051505  020124
6892  046724  043117  052040  043501
6893  046732  040440  042104  042522
6894  046740  051523  041040  052111
6895  046746  020123  040506  046111
6896  046754  042105  005015
6897  046760  020040  020040  020040          .ASCIZ*       ADDRESS COULD NOT BE MADE A HIT*
6898  046766  040440  042104  042522
6899  046774  051523  041440  052517
6900  047002  042114  047040  052117
6901  047010  041040  020105  040515
6902  047016  042504  040440  044040
6903  047024  052111     000
6904  047027     105  051122  051117  EM56:   .ASCIZ*ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA FIELD*
6905  047034  020072  047514  020127
6906  047042  054502  042524  050040
6907  047050  051101  052111  020131
6908  047056  051105  047522  020122
6909  047064  044127  047105  052040
6910  047072  051505  044524  043516
6911  047100  042040  052101  020101
6912  047106  044506  046105  000104
6913  047114  051105  047522  035122  EM57:   .ASCIZ*ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA FIELD*
6914  047122  044040  043511  020110
6915  047130  054502  042524  050040
6916  047136  051101  052111  020131
6917  047144  051105  047522  020122
6918  047152  044127  047105  052040
6919  047160  051505  044524  043516
6920  047166  042040  052101  020101
6921  047174  044506  046105  000104
6922  047202  051105  047522  035122  EM60:   .ASCIZ*ERROR: TAG PARITY ERROR WHEN TESTING DATA FIELD*
6923  047210  052040  043501  050040
6924  047216  051101  052111  020131
6925  047224  051105  047522  020122
6926  047232  044127  047105  052040
6927  047240  051505  044524  043516
6928  047246  042040  052101  020101
6929  047254  044506  046105  000104
6930  047262  051105  047522  035122  EM61:   .ASCIZ*ERROR: CACHE DATA LOC HELD WRONG DATA*
6931  047270  041440  041501  042510
6932  047276  042040  052101  020101
6933  047304  047514  020103  042510
6934  047312  042114  053440  047522
6935  047320  043516  042040  052101
6936  047326  000101
6937  047330  051105  047522  035122  EM62:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE DATA FIELD FAILED*<15><12>
6938  047336  042524  052123  047440
6939  047344  020106  051515  020102
6940  047352  042101  051104  051505
6941  047360  020123  040450  030061
6942  047366  020051  047524  041440
6943  047374  041501  042510  042040
6944  047402  052101  020101  044506
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6945  047410  046105  020104  040506
6946  047416  046111  042105  005015
6947  047424  020040  020040  020040          .ASCIZ*       ADDRESS COULD NOT BE MADE HIT*
6948  047432  042101  051104  051505
6949  047440  020123  047503  046125
6950  047446  020104  047516  020124
6951  047454  042502  046440  042101
6952  047462  020105  044510  000124
6953  047470  051105  047522  035122  EM63:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE DATA FIELD FAILED*<15><12>
6954  047476  042524  052123  047440
6955  047504  020106  051515  020102
6956  047512  042101  051104  051505
6957  047520  020123  040450  030061
6958  047526  020051  047524  041440
6959  047534  041501  042510  042040
6960  047542  052101  020101  044506
6961  047550  046105  020104  040506
6962  047556  046111  042105  005015
6963  047564  020040  020040  020040          .ASCIZ*       ADDRESS HELD WRONG DATA*
6964  047572  042101  051104  051505
6965  047600  020123  042510  042114
6966  047606  053440  047522  043516
6967  047614  042040  052101  000101
6968  047622  051105  047522  035122  EM64:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE DATA FIELD FAILED*<15><12>
6969  047630  042524  052123  047440
6970  047636  020106  051515  020102
6971  047644  042101  051104  051505
6972  047652  020123  040450  030061
6973  047660  020051  047524  041440
6974  047666  041501  042510  042040
6975  047674  052101  020101  044506
6976  047702  046105  020104  040506
6977  047710  046111  042105  005015
6978  047716  020040  020040  020040          .ASCIZ*       PARITY ERROR LOW BYTE*
6979  047724  040520  044522  054524
6980  047732  042440  051122  051117
6981  047740  046040  053517  041040
6982  047746  052131  000105
6983  047752  051105  047522  035122  EM65:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE DATA FIELD FAILED*<15><12>
6984  047760  042524  052123  047440
6985  047766  020106  051515  020102
6986  047774  042101  051104  051505
6987  050002  020123  040450  030061
6988  050010  020051  047524  041440
6989  050016  041501  042510  042040
6990  050024  052101  020101  044506
6991  050032  046105  020104  040506
6992  050040  046111  042105  005015
6993  050046  020040  020040  020040          .ASCIZ*       PARITY ERROR HIGH BYTE*
6994  050054  040520  044522  054524
6995  050062  042440  051122  051117
6996  050070  044040  043511  020110
6997  050076  054502  042524     000
6998  050103     105  051122  051117  EM66:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE DATA FIELD FAILED*<15><12>
6999  050110  052072  051505  020124
7000  050116  043117  046440  041123
```



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7001  050124  040440  042104  042522
7002  050132  051523  024040  030501
7003  050140  024460  052040  020117
7004  050146  040503  044103  020105
7005  050154  040504  040524  043040
7006  050162  042511  042114  043040
7007  050170  044501  042514  006504
7008  050176     012
7009  050177     040  020040  020040          .ASCIZ*       PARITY ERROR TAG*
7010  050204  050040  051101  052111
7011  050212  020131  051105  047522
7012  050220  020122  040524  000107
7013  050226  051105  047522  035122  EM67:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE ADDRESS FIELD FAILED*<15><12>
7014  050234  042524  052123  047440
7015  050242  020106  051515  020102
7016  050250  042101  051104  051505
7017  050256  020123  040450  030061
7018  050264  020051  047524  041440
7019  050272  041501  042510  040440
7020  050300  042104  042522  051523
7021  050306  043040  042511  042114
7022  050314  043040  044501  042514
7023  050322  006504     012
7024  050325     040  020040  020040          .ASCIZ*       ADDRESS COULD NOT BE MADE A HIT*
7025  050332  040440  042104  042522
7026  050340  051523  041440  052517
7027  050346  042114  047040  052117
7028  050354  041040  020105  040515
7029  050362  042504  040440  044040
7030  050370  052111     000
7031  050373     105  051122  051117  EM70:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE ADDRESS FIELD FAILED*<15><12>
7032  050400  052072  051505  020124
7033  050406  043117  046440  041123
7034  050414  040440  042104  042522
7035  050422  051523  024040  030501
7036  050430  024460  052040  020117
7037  050436  040503  044103  020105
7038  050444  042101  051104  051505
7039  050452  020123  044506  046105
7040  050460  020104  040506  046111
7041  050466  042105  005015
7042  050472  020040  020040  020040          .ASCIZ*       TAG PARITY ERROR*
7043  050500  040524  020107  040520
7044  050506  044522  054524  042440
7045  050514  051122  051117     000
7046  050521     105  051122  051117  EM71:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE ADDRESS FIELD FAILED*<15><12>
7047  050526  052072  051505  020124
7048  050534  043117  046440  041123
7049  050542  040440  042104  042522
7050  050550  051523  024040  030501
7051  050556  024460  052040  020117
7052  050564  040503  044103  020105
7053  050572  042101  051104  051505
7054  050600  020123  044506  046105
7055  050606  020104  040506  046111
7056  050614  042105  005015
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7057  050620  020040  020040  020040          .ASCIZ*      LOW BYTE PARITY ERROR*
7058  050626  047514  020127  054502
7059  050634  042524  050040  051101
7060  050642  052111  020131  051105
7061  050650  047522  000122
7062  050654  051105  047522  035122  EM72:   .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO CACHE ADDRESS FIELD FAILED*<15><12>
7063  050662  042524  052123  047440
7064  050670  020106  051515  020102
7065  050676  042101  051104  051505
7066  050704  020123  040450  030061
7067  050712  020051  047524  041440
7068  050720  041501  042510  040440
7069  050726  042104  042522  051523
7070  050734  043040  042511  042114
7071  050742  043040  044501  042514
7072  050750  006504     012
7073  050753     040  020040  020040          .ASCIZ*      HIGH BYTE PARITY ERROR*
7074  050760  044040  043511  020110
7075  050766  054502  042524  050040
7076  050774  051101  052111  020131
7077  051002  051105  047522  000122
7078  051010  051105  047522  035122  EM73:   .ASCII*ERROR:DYNAMIC TEST OF CACHE FAILED*<15><12>
7079  051016  054504  040516  044515
7080  051024  020103  042524  052123
7081  051032  047440  020106  040503
7082  051040  044103  020105  040506
7083  051046  046111  042105  005015
7084  051054  020040  020040  020040          .ASCIZ*      LOC HELD WRONG DATA*
7085  051062  047514  020103  042510
7086  051070  042114  053440  047522
7087  051076  043516  042040  052101
7088  051104  000101
7089  051106  051105  047522  035122  EM74:   .ASCII*ERROR:DYNAMIC TEST OF CACHE FAILED*<15><12>
7090  051114  054504  040516  044515
7091  051122  020103  042524  052123
7092  051130  047440  020106  040503
7093  051136  044103  020105  040506
7094  051144  046111  042105  005015
7095  051152  020040  020040  020040          .ASCIZ*      TRAP TO 10 OCCURRED*
7096  051160  051124  050101  052040
7097  051166  020117  030061  047440
7098  051174  041503  051125  042522
7099  051202  000104
7100  051204  051105  047522  035122  EM75:   .ASCII*ERROR:DYNAMIC TEST OF CACHE FAILED*<15><12>
7101  051212  054504  040516  044515
7102  051220  020103  042524  052123
7103  051226  047440  020106  040503
7104  051234  044103  020105  040506
7105  051242  046111  042105  005015
7106  051250  020040  020040  020040          .ASCIZ*      LOW BYTE PARITY ERROR*
7107  051256  047514  020127  054502
7108  051264  042524  050040  051101
7109  051272  052111  020131  051105
7110  051300  047522  000122
7111  051304  051105  047522  035122  EM76:   .ASCII*ERROR:DYNAMIC TEST OF CACHE FAILED*<15><12>
7112  051312  054504  040516  044515
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7113  051320  020103  042524  052123
7114  051326  047440  020106  040503
7115  051334  044103  020105  040506
7116  051342  046111  042105  005015
7117  051350  020040  020040  020040          .ASCIZ*      HIGH BYTE PARITY ERROR*
7118  051356  044510  044107  041040
7119  051364  052131  020105  040520
7120  051372  044522  054524  042440
7121  051400  051122  051117     000
7122  051405     105  051122  051117  EM77:   .ASCII*ERROR:DYNAMIC TEST OF CACHE FAILED*<15><12>
7123  051412  042072  047131  046501
7124  051420  041511  052040  051505
7125  051426  020124  043117  041440
7126  051434  041501  042510  043040
7127  051442  044501  042514  006504
7128  051450     012
7129  051451     040  020040  020040          .ASCIZ*      TAG PARITY ERROR*
7130  051456  052040  043501  050040
7131  051464  051101  052111  020131
7132  051472  051105  047522  000122
7133  051500  051105  047522  035122  EM101:  .ASCIZ*ERROR:CACHE CONTROL REG NOT INITIALIZED BY POWER FAIL*
7134  051506  040503  044103  020105
7135  051514  047503  052116  047522
7136  051522  020114  042522  020107
7137  051530  047516  020124  047111
7138  051536  052111  040511  044514
7139  051544  042532  020104  054502
7140  051552  050040  053517  051105
7141  051560  043040  044501  000114
7142  051566  051105  047522  035122  EM102:  .ASCIZ*ERROR:POWER UP FAILED TO INVALIDATE CACHE*
7143  051574  047520  042527  020122
7144  051602  050125  043040  044501
7145  051610  042514  020101  047524
7146  051616  044440  053116  046101
7147  051624  042111  052101  020105
7148  051632  040503  044103  000105
7149  051640  051105  047522  035122  EM103:  .ASCIZ*ERROR:DEVICE ERROR BIT SET WHEN DOING NPR, DATO TO ADDRESS*
7150  051646  042504  044526  042503
7151  051654  042440  051122  051117
7152  051662  041040  052111  051440
7153  051670  052105  053440  042510
7154  051676  020116  047504  047111
7155  051704  020107  050116  026122
7156  051712  042040  052101  020117
7157  051720  047524  040440  042104
7158  051726  042522  051523     000
7159  051733     105  051122  051117  EM104:  .ASCIZ*ERROR:CACHE LOCATION NOT INVALIDATED BY NPR, DATO TO ADDRESS*
7160  051740  041472  041501  042510
7161  051746  046040  041517  052101
7162  051754  047511  020116  047516
7163  051762  020124  047111  040526
7164  051770  044514  040504  042524
7165  051776  020104  054502  047040
7166  052004  051120  020054  040504
7167  052012  047524  052040  020117
7168  052020  042101  051104  051505
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7169  052026  000123
7170  052030  051105  047522  035122  EM105:  .ASCII*ERROR:DID NOT GET PARITY TRAP WHEN DID NPR, DATO TO ADDRESS*<CR><LF>
7171  052036  044504  020104  047516
7172  052044  020124  042507  020124
7173  052052  040520  044522  054524
7174  052060  052040  040522  020120
7175  052066  044127  047105  042040
7176  052074  042111  047040  051120
7177  052102  020054  040504  047524
7178  052110  052040  020117  042101
7179  052116  051104  051505  006523
7180  052124     012
7181  052125     040  020040  020040          .ASCIZ*      WRITTEN WITH WRONG PARITY*
7182  052132  053440  044522  052124
7183  052140  047105  053440  052111
7184  052146  020110  051127  047117
7185  052154  020107  040520  044522
7186  052162  054524     000
7187  052165     105  051122  051117  EM107:  .ASCIZ*ERROR:CACHE DID NOT TRACK WHEN FORCE MISS ON*
7188  052172  041472  041501  042510
7189  052200  042040  042111  047040
7190  052206  052117  052040  040522
7191  052214  045503  053440  042510
7192  052222  020116  047506  041522
7193  052230  020105  044515  051523
7194  052236  047440  000116
7195  052242  051105  047522  035122  EM110:  .ASCIZ*ERROR:RETRY TO BACKING STORE NOT DONE ON CACHE PARITY TRAP*
7196  052250  042522  051124  020131
7197  052256  047524  041040  041501
7198  052264  044513  043516  051440
7199  052272  047524  042522  047040
7200  052300  052117  042040  047117
7201  052306  020105  047117  041440
7202  052314  041501  042510  050040
7203  052322  051101  052111  020131
7204  052330  051124  050101     000
7205  052335     105  051122  051117  EM111:  .ASCII*ERROR:TEST OF VALID BIT FAILED*<CR><LF>
7206  052342  052072  051505  020124
7207  052350  043117  053040  046101
7208  052356  042111  041040  052111
7209  052364  043040  044501  042514
7210  052372  006504     012
7211  052375     040  020040  020040          .ASCIZ*      LOC COULD NOT BE MADE A HIT*
7212  052402  046040  041517  041440
7213  052410  052517  042114  047040
7214  052416  052117  041040  020105
7215  052424  040515  042504  040440
7216  052432  044040  052111     000
7217  052437     105  051122  051117  EM112:  .ASCII*ERROR:TEST OF VALID BIT FAILED*<CR><LF>
7218  052444  052072  051505  020124
7219  052452  043117  053040  046101
7220  052460  042111  041040  052111
7221  052466  043040  044501  042514
7222  052474  006504     012
7223  052477     040  020040  020040          .ASCIZ*      LOC NOT INVALIDATED BY PARITY TRAP*
7224  052504  046040  041517  047040
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7225  052512  052117  044440  053116
7226  052520  046101  042111  052101
7227  052526  042105  041040  020131
7228  052534  040520  044522  054524
7229  052542  052040  040522  000120
7230  052550  051105  047522  035122  EM113:  .ASCIZ*ERROR:ADDRESS NOT INVALIDATED BY CONSOLE SWEEP*<CR><LF>
7231  052556  042101  051104  051505
7232  052564  020123  047516  020124
7233  052572  047111  040526  044514
7234  052600  040504  042524  020104
7235  052606  054502  041440  047117
7236  052614  047523  042514  051440
7237  052622  042527  050105  005015
7238  052630     000
7239  052631     105  051122  051117  EM114:  .ASCIZ*ERROR:LOC WRITTEN WITH WRONG PARITY NOT INVALIDATED VIA NPR DATO*
7240  052636  046072  041517  053440
7241  052644  044522  052124  047105
7242  052652  053440  052111  020110
7243  052660  051127  047117  020107
7244  052666  040520  044522  054524
7245  052674  047040  052117  044440
7246  052702  053116  046101  042111
7247  052710  052101  042105  053040
7248  052716  040511  047040  051120
7249  052724  042040  052101  000117
7250  052732  051105  047522  035122  EM115:  .ASCII*ERROR:PARITY TRAP WHILE TESTING LOC WRITTEN WITH WRONG PARITY*<CR><LF>
7251  052740  040520  044522  054524
7252  052746  052040  040522  020120
7253  052754  044127  046111  020105
7254  052762  042524  052123  047111
7255  052770  020107  047514  020103
7256  052776  051127  052111  042524
7257  053004  020116  044527  044124
7258  053012  053440  047522  043516
7259  053020  050040  051101  052111
7260  053026  006531     012
7261  053031     040  020040  020040          .ASCIZ*      AND INVALIDATING IT VIA NPR DATO*
7262  053036  040440  042116  044440
7263  053044  053116  046101  042111
7264  053052  052101  047111  020107
7265  053060  052111  053040  040511
7266  053066  047040  051120  042040
7267  053074  052101  000117
7268  053100  051105  047522  035122  EM116:  .ASCIZ*ERROR:CACHE ALLOCATED DURING ODD ADDRESS TRAP*
7269  053106  040503  044103  020105
7270  053114  046101  047514  040503
7271  053122  042524  020104  052504
7272  053130  044522  043516  047440
7273  053136  042104  040440  042104
7274  053144  042522  051523  052040
7275  053152  040522  000120
7276  053156  051105  047522  035122  EM117:  .ASCIZ*ERROR:CACHE ALLOCATED DURING RED ZONE TRAP*
7277  053164  040503  044103  020105
7278  053172  046101  047514  040503
7279  053200  042524  020104  052504
7280  053206  044522  043516  051040
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7281  053214  042105  055040  047117
7282  053222  020105  051124  050101
7283  053230     000
7284  053231     105  051122  051117  EM120:  .ASCIZ*ERROR:CACHE ALLOCATED DURING KT ABORT*
7285  053236  041472  041501  042510
7286  053244  040440  046114  041517
7287  053252  052101  042105  042040
7288  053260  051125  047111  020107
7289  053266  052113  040440  047502
7290  053274  052122     000
7291  053277     105  051122  051117  EM121:  .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED*<CR><LF>
7292  053304  052072  051505  020124
7293  053312  043117  046440  041123
7294  053320  040440  042104  042522
7295  053326  051523  024040  030501
7296  053334  024460  052040  020117
7297  053342  040526  044514  020104
7298  053350  044502  020124  040506
7299  053356  046111  042105  005015
7300  053364  020040  020040  020040          .ASCIZ*      LOC NOT INVALIDATED*
7301  053372  047514  020103  047516
7302  053400  020124  047111  040526
7303  053406  044514  040504  042524
7304  053414  000104
7305  053416  051105  047522  035122  EM122:  .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED*<CR><LF>
7306  053424  042524  052123  047440
7307  053432  020106  051515  020102
7308  053440  042101  051104  051505
7309  053446  020123  040450  030061
7310  053454  020051  047524  053040
7311  053462  046101  042111  041040
7312  053470  052111  043040  044501
7313  053476  042514  006504     012
7314  053503     011  020040  020040          .ASCIZ*      PARITY ERROR TAG*
7315  053510  050040  051101  052111
7316  053516  020131  051105  047522
7317  053524  020122  040524  000107
7318  053532  051105  047522  035122  EM123:  .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED*<CR><LF>
7319  053540  042524  052123  047440
7320  053546  020106  051515  020102
7321  053554  042101  051104  051505
7322  053562  020123  040450  030061
7323  053570  020051  047524  053040
7324  053576  046101  042111  041040
7325  053604  052111  043040  044501
7326  053612  042514  006504     012
7327  053617     011  020040  020040          .ASCIZ*      PARITY ERROR LOW BYTE*
7328  053624  050040  051101  052111
7329  053632  020131  051105  047522
7330  053640  020122  047514  020127
7331  053646  054502  042524     000
7332  053653     105  051122  051117  EM124:  .ASCII*ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED*<CR><LF>
7333  053660  052072  051505  020124
7334  053666  043117  046440  041123
7335  053674  040440  042104  042522
7336  053702  051523  024040  030501
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7337  053710  024460  052040  020117
7338  053716  040526  044514  020104
7339  053724  044502  020124  040506
7340  053732  046111  042105  005015
7341  053740  020011  020040  020040          .ASCIZ*      PARITY ERROR HIGH BYTE*
7342  053746  040520  044522  054524
7343  053754  042440  051122  051117
7344  053762  044040  043511  020110
7345  053770  054502  042524     000
7346
7347  053775     120  036503  020040  DH1:    .ASCIZ*PC=   / P ADDH/ P ADDL/ PC OF PE*
7348  054002  027440  050040  040440
7349  054010  042104  027510  050040
7350  054016  040440  042104  027514
7351  054024  050040  020103  043117
7352  054032  050040  000105

7353  054036  041520  020075  020040  DH2:    .ASCIZ*PC=   / P ADDH/ P ADDL/ DATA/ PC OF PE*
7354  054044  020057  020120  042101
7355  054052  044104  020057  020120
7356  054060  042101  046104  020057
7357  054066  040504  040524  020057
7358  054074  041520  047440  020105
7359  054102  042520     000
7360  054105     120  036503  020040  DH5:    .ASCIZ*PC=   / DATA IS/DATA SHOULD BE*
7361  054112  027440  042040  052101
7362  054120  020101  051511  042057
7363  054126  052101  020101  044123
7364  054134  052517  042114  041040
7365  054142  000105
7366  054144  041520  020075  020040  DH6:    .ASCIZ*PC=   / DATA IS/DATA EXPECTED SET (0= DON'T CARE)*
7367  054152  020057  040504  040524
7368  054160  044440  027523  040504
7369  054166  040524  042440  050130
7370  054174  041505  042524  020104
7371  054202  042523  020124  030050
7372  054210  020075  047504  023516
7373  054216  020124  040503  042522
7374  054224  000051
7375  054226  041520  020075  020040  DH7:    .ASCIZ*PC=   /  P ADDH/ P ADDL*
7376  054234  020057  050040  040440
7377  054242  042104  027510  050040
7378  054250  040440  042104  000114
7379  054256  041520  020075  020040  DH11:   .ASCIZ*PC=   / P ADDH/ P ADDL/ DATA IS/ DATA SHOULD BE*
7380  054264  020057  020120  042101
7381  054272  044104  020057  020120
7382  054300  042101  046104  020057
7383  054306  040504  040524  044440
7384  054314  027523  042040  052101
7385  054322  020101  044123  052517
7386  054330  042114  041040  000105
7387  054336  041520  020075  020040  DH12:   .ASCIZ*PC=   / (CCR)  / P ADDH/ P ADDL*
7388  054344  020057  041450  051103
7389  054352  020051  027440  050040
7390  054360  040440  042104  027510
7391  054366  050040  040440  042104
7392  054374  000114
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 7393  054376  041520  020075  020040  DH16:   .ASCIZ*PC=   /(CER)/PC WHEN TRAPPED*
 7394  054404  024057  042503  024522
 7395  054412  050057  020103  044127
 7396  054420  047105  052040  040522
 7397  054426  050120  042105     000
 7398  054433     120  036503  020040  DH21:   .ASCIZ*PC=   / P ADDH/ P ADDL/ (EREG)*
 7399  054440  027440  050040  040440
 7400  054446  042104  027510  050040
 7401  054454  040440  042104  027514
 7402  054462  024040  051105  043505
 7403  054470  000051
 7404  054472  041520  020075  020040  DH22:   .ASCIZ*PC=   / P ADDH/ P ADDL/ TAG FIELD=*
 7405  054500  020057  020120  042101
 7406  054506  044104  020057  020120
 7407  054514  042101  046104  020057
 7408  054522  040524  020107  044506
 7409  054530  046105  036504     000
 7410  054535     120  036503  020040  DH27:   .ASCIZ*PC=   / P ADDH/ P ADDL/ TAG SHOULD=*
 7411  054542  027440  050040  040440
 7412  054550  042104  027510  050040
 7413  054556  040440  042104  027514
 7414  054564  052040  043501  051440
 7415  054572  047510  046125  036504
 7416  054600     000
 7417  054601     120  036503  020040  DH30:   .ASCIZ*PC=   / P ADDH/ P ADDL/ (TAG)/ (TAG) SHOULD BE*
 7418  054606  027440  050040  040440
 7419  054614  042104  027510  050040
 7420  054622  040440  042104  027514
 7421  054630  024040  040524  024507
 7422  054636  020057  052050  043501
 7423  054644  020051  044123  052517
 7424  054652  042114  041040  000105
 7425  054660  041520  020075  020040  DH35:   .ASCIZ*PC=   / P ADDH/ P ADDL/ DATA SHOULD=*
 7426  054666  020057  020120  042101
 7427  054674  044104  020057  020120
 7428  054702  042101  046104  020057
 7429  054710  040504  040524  051440
 7430  054716  047510  046125  036504
 7431  054724     000
 7432  054725     120  036503  020040  DH45:   .ASCIZ*PC=   / P ADDH/ P ADDL/ DATA=*
 7433  054732  027440  050040  040440
 7434  054740  042104  027510  050040
 7435  054746  040440  042104  027514
 7436  054754  042040  052101  036501
 7437  054762     000
 7438  054763     120  036503  020040  DH100:  .ASCIZ*PC=   /DATA=*
 7439  054770  027440  040504  040524
 7440  054776  000075
 7441  055000  041520  000075          DH107:  .ASCIZ*PC=*
 7442                                          .EVEN
 7443  055004  001116  001160  001162  DT1:    .WORD   $ERRPC,$REG1,$REG2,$REG3,$REG4,0
 7444  055012  001164  001166  000000
 7445  055020  001116  001160  001162  DT5:    .WORD   $ERRPC,$REG1,$REG2,0
 7446  055026  000000
 7447  055030  001116  001160  001162  DT12:   .WORD   $ERRPC,$REG1,$REG2,$REG3,0
 7448  055036  001164  000000
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 7449  055042  001116  001160  000000  DT16:   .WORD   $ERRPC,$REG1,0
 7450  055050  001116  001160  001162  DT35:   .WORD   $ERRPC,$REG1,$REG2,$REG4,0
 7451  055056  001166  000000
 7452  055062  001116  001160  000000  DT100:  .WORD   $ERRPC,$REG1,0
 7453  055070  001116  000000          DT107:  .WORD   $ERRPC,0
 7454
 7455                                  ;;*****************************************************************
 7456                                  ;;*****************************************************************
 7457
 7458                                  .SBTTL  ERROR POINTER TABLE
 7459
 7460                                  ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
 7461                                  ;* THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
 7462                                  ;*LOCATION $ITEMB, THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
 7463
 7464                                  ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
 7465                                  ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
 7466
 7467                                  ;*      EM                      ;;POINTS TO THE ERROR MESSAGE
 7468                                  ;*      DH                      ;;POINTS TO THE DATA HEADER
 7469                                  ;*      DT                      ;;POINTS TO THE DATA
 7470                                  ;*      DF                      ;;POINTS TO THE DATA FORMAT
 7471
 7472  055074                          $ERRTB:
 7473
 7474                                  ;ITEM 1
 7475  055074  041752                          EM1                     ;ERROR: UNEXPECTED PARITY ERROR IN BACKING STORE
 7476  055076  053775                          DH1                     ;PC=/P ADDH /P ADDL /PC OF PE
 7477  055100  055030                          DT12                    ;$ERRPC,$REG1,$REG2,$REG3
 7478  055102  000000                          0
 7479                                  ;ITEM 2
 7480  055104  042032                          EM2                     ;ERROR:UNEXPECTED PARITY ERROR IN CACHE TAG
 7481  055106  054036                          DH2                     ;PC= /P ADDH /P ADDL /DATA /PC OF PE
 7482  055110  055004                          DT1                     ;$ERRPC,$REG1,$REG2,$REG3,$REG4
 7483  055112  000000                          0
 7484                                  ;ITEM 3
 7485  055114  042106                          EM3                     ;ERROR:UNEXPECTED PARITY ERROR IN CACHE DATA LOW
 7486  055116  054036                          DH2                     ;PC= /P ADDH /P ADDL /DATA /PC OF PE
 7487  055120  055004                          DT1                     ;$ERRPC,$REG1,$REG2,$REG3,$REG4
 7488  055122  000000                          0
 7489                                  ;ITEM 4
 7490  055124  042167                          EM4                     ;ERROR:UNEXPECTED PARITY ERROR IN CACHE DATA HIGH
 7491  055126  054036                          DH2                     ;PC= /P ADDH /P ADDL /DATA / PC OF PE
 7492  055130  055004                          DT1                     ;$ERRPC,$REG1,$REG2,$REG3,$REG4
 7493  055132  000000                          0
 7494                                  ;ITEM 5
 7495  055134  042251                          EM5                     ;FATAL ERROR: CACHE CONTROL REG HELD WRONG DATA
 7496  055136  054105                          DH5                     ;PC=/DATA IS /DATA SHOULD BE
 7497  055140  055020                          DT5                     ;$ERRPC,$REG1,$REG2
 7498  055142  000000                          0
 7499                                  ;ITEM 6
 7500  055144  042330                          EM6                     ;FATAL ERROR: HIT MISS REG HELD WRONG DATA
 7501  055146  054105                          DH5                     ;PC=/DATA IS/DATA SHOULD BE
 7502  055150  055020                          DT5                     ;$ERRPC,$REG1,$REG2
 7503  055152  000000                          0
 7504                                  ;ITEM 7
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 7505  055154  042402                        EM7                     ;ERROR:DATA CACHED ON DATOB TO NO 'HIT' ADDR..
 7506  055156  054226                        DH7                     ;PC=/P ADDH/P ADDL
 7507  055160  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7508  055162  000000                        0
 7509                                  ;ITEM 10
 7510  055164  042460                        EM10                    ;ERROR: DATA NOT CACHED ON DATOB TO A HIT LOC.
 7511  055166  054226                        DH7                     ;PC=/P ADDH/P ADDL
 7512  055170  055020                        DT5                     ;$ERRPC,$REG1,RREG2
 7513  055172  000000                        0
 7514                                  ;ITEM 11
 7515  055174  042541                        EM11                    ;ERROR:CACHE DID NOT CONTAIN PROPER DATA ON DATOB
 7516  055176  054256                        DH11                    ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7517  055200  055004                        DT1                     ;$ERRPC,$REG1,$REG2,$REG3,$REG4
 7518  055202  000000                        0
 7519                                  ;ITEM 12
 7520  055204  042623                        EM12                    ;ERROR: FORCE MISS BIT FAILED TO CAUSE MISS
 7521  055206  054336                        DH12                    ;PC=/(CCR)/P ADDH/P ADDL
 7522  055210  055030                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
 7523  055212  000000                        0
 7524                                  ;ITEM 13
 7525  055214  042330                        EM6                     ;FATAL ERROR: HIT MISS REG HELD WRONG DATA
 7526  055216  054144                        DH6                     ;PC=/DATA IS/DATA EXPECTED SET (0= DON'T CARE)
 7527  055220  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7528  055222  000000                        0
 7529                                  ;ITEM 14
 7530  055224  042676                        EM14                    ;ERROR: ADDRESS COULD NOT BE MADE A HIT AFTER DATO TO IT
 7531  055226  054226                        DH7                     ;PC=/P ADDH/P ADDL
 7532  055230  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7533  055232  000000                        0
 7534                                  ;ITEM 15
 7535  055234  000000                        0
 7536  055236  000000                        0
 7537  055240  000000                        0
 7538  055242  000000                        0
 7539                                  ;ITEM 16
 7540  055244  042770                        EM16                    ;ERROR: UNEXPECTED TRAP TO VECTOR 4
 7541  055246  054376                        DH16                    ;PC= /(CER)/PC WHEN TRAPPED
 7542  055250  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7543  055252  000000                        0
 7544                                  ;ITEM 17
 7545  055254  043033                        EM17                    ;ERROR: FORCE MISS DID NOT PREVENT CACHE TRACKING
 7546  055256  054226                        DH7                     ;PC=/P ADDH/P ADDL
 7547  055260  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7548  055262  000000                        0
 7549                                  ;ITEM 20
 7550  055264  043114                        EM20                    ;ERROR: PHYSICAL ADDRESS LINES ERROR
 7551                                  ;               ADDR. HELD WRONG DATA
 7552  055266  054256                        DH11                    ;PC=/P ADDH/P ADDL/DATA IS/ DATA SHOULD BE
 7553  055270  055004                        DT1                     ;$ERRPC,$REG1,$REG2,$REG3
 7554  055272  000000                        0
 7555                                  ;ITEM 21
 7556  055274  043221                        EM21                    ;ERROR: TRAP TO VECTOR 4 WHEN TESTING P.A. LINES
 7557  055276  054433                        DH21                    ;PC=/P ADDH/P ADDL/(EREG)
 7558  055300  055030                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
 7559  055302  000000                        0
 7560                                  ;ITEM 22
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 7561  055304  043316                        EM22                    ;ERROR: TEST OF ADDR. COMPARATOR FAILED TO BE A MISS
 7562  055306  054472                        DH22                    ;PC=/P ADDH/P ADDL/TAG FIELD=
 7563  055310  055030                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
 7564  055312  000000                        0
 7565                                  ;ITEM 23
 7566  055314  043310                        EM23                    ;ERROR: TEST OF ADDR. COMPARATOR FAILED TO BE A HIT
 7567  055316  054472                        DH22                    ;PC=/P ADDH/P ADDL/TAG FIELD=
 7568  055320  055030                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
 7569  055322  000000                        0
 7570                                  ;ITEM 24
 7571  055324  043501                        EM24                    ;ERROR: FORCE MISS DID NOT INHIBIT PARITY ERRORS
 7572  055326  000000                        0
 7573  055330  000000                        0
 7574  055332  000000                        0
 7575                                  ;ITEM 25
 7576  055334  043560                        EM25                    ;ERROR: DATO TO I/O ADDRESS WRITTEN IN CACHE
 7577  055336  054226                        DH7                     ;PC=/P ADDH/P ADDL
 7578  055340  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7579  055342  000000                        0
 7580                                  ;ITEM 26
 7581  055344  043633                        EM26                    ;ERROR: CACHE CONTROL REG HOLD WRONG DATA
 7582  055346  054105                        DH5                     ;PC=/DATA IS /DATA SHOULD BE
 7583  055350  055020                        DT5                     ;$ERRPC,$REG1,$REG2
 7584  055352  000000                        0
 7585                                  ;ITEM 27
 7586  055354  043703                        EM27                    ;ERROR: TEST OF TAG PARITY GEN/CKER FAILED
 7587                                  ;               NO TAG PARITY TRAP WHEN WWP
 7588  055356  054535                        DH27                    ;PC=/P ADDH/P ADDL/(TAG) SHOULD BE
 7589  055360  055030                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
 7590  055362  000000                        0
 7591                                  ;ITEM 30
 7592  055364  043703                        EM27                    ;ERROR: TEST OF TAG PARITY GEN/CKER FAILED
 7593                                  ;               NO TAG PARITY TRAP WHEN WWP
 7594  055366  054601                        DH30                    ;PC=/P ADDH/P ADDL/(TAG)/(TAG) SHOULD BE
 7595  055370  055004                        DT1                     ;$ERRPC,$REG1,$REG2,$REG3,$REG4
 7596  055372  000000                        0
 7597                                  ;ITEM 31
 7598  055374  044073                        EM31                    ;ERROR: TEST OF TAG PARITY GEN/CKER FAILED
 7599                                  ;               (TAG) BAD ON PTRAP
 7600  055376  054601                        DH30                    ;PC=/P ADDH/P ADDL/(TAG)/(TAG) SHOULD BE
 7601  055400  055004                        DT1                     ;$ERRPC,$REG1,$REG2,$REG3
 7602  055402  000000                        0
 7603                                  ;ITEM 32
 7604  055404  044235                        EM32                    ;ERROR: TEST OF TAG PARITY GEN/CKER FAILED
 7605                                  ;               PARITY ERROR HIGH DATA BYTE
 7606  055406  054256                        DH11                    ;PC=/P ADDH/P ADDL/DATA IS/ DATA SHOULD BE
 7607  055410  055004                        DT1                     ;$ERRPC,$REG1,$REG2,$REG3
 7608  055412  000000                        0
 7609                                  ;ITEM 33
 7610  055414  044365                        EM33                    ;ERROR: TEST OF TAG PARITY GEN/CKER FAILED
 7611                                  ;               PARITY ERROR LOW DATA BYTE
 7612  055416  054256                        DH11                    ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7613  055420  055004                        DT1                     ;$ERRPC,$REG1,$REG2,$REG3
 7614  055422  000000                        0
 7615                                  ;ITEM 34
 7616  055424  044514                        EM34                    ;ERROR: TEST OF TAG PARITY GEN/CKER FAILED
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                                                                ;       PARITY ERROR IN TAG
 7618  055426  054601                                  DH30     ;PC=/P ADDH/P ADDL/(TAG)/(TAG) SHOULD BE
 7619  055430  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7620  055432  000000                                  0
 7621                                                ;ITEM 35
 7622  055434  044637                                  EM35     ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
 7623                                                           ;       NO PARITY TRAP OCCURRED
 7624  055436  054660                                  DH35     ;PC=/P ADDH/P ADDL/DATA SHOULD=
 7625  055440  055050                                  DT35     ;$ERRPC,$REG1,$REG2,$REG4
 7626  055442  000000                                  0
 7627                                                ;ITEM 36
 7628  055444  045000                                  EM36     ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
 7629                                                           ;       NO PARITY TRAP FROM LOW BYTE WHEN WWP
 7630  055446  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7631  055450  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3,$REG4
 7632  055452  000000                                  0
 7633                                                ;ITEM 37
 7634  055454  045157                                  EM37     ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
 7635                                                           ;       NO PARITY TRAP FROM HIGH BYTE WHEN WWP
 7636  055456  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7637  055460  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7638  055462  000000                                  0
 7639                                                ;ITEM 40
 7640  055464  045337                                  EM40     ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
 7641                                                           ;       PARITY ERROR LOW BYTE
 7642  055466  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7643  055470  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7644  055472  000000                                  0
 7645                                                ;ITEM 41
 7646  055474  045462                                  EM41     ;ERROR: TEST OF DATA PARITY GEN/CKER FAILED
 7647                                                           ;       PARITY ERROR HIGH BYTE
 7648  055476  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7649  055500  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7650  055502  000000                                  0
 7651                                                ;ITEM 42
 7652  055504  045606                                  EM42     ;ERROR: NO PARITY TRAP FROM LOC WRITTEN WITH WRONG PARIT
 7653  055506  054226                                  DH7      ;PC=/P ADDH/P ADDL
 7654  055510  055020                                  DT5      ;$ERRPC,$REG1,$REG2
 7655  055512  000000                                  0
 7656                                                ;ITEM 43
 7657  055514  045676                                  EM43     ;ERR0R:ADDRESS COULD NOT BE MADE A HIT
 7658  055516  054226                                  DH7      ;PC=/P ADDH/P ADDL
 7659  055520  055020                                  DT5      ;$ERRPC,$REG1,$REG2
 7660  055522  000000                                  0
 7661                                                ;ITEM 44
 7662  055524  045745                                  EM44     ;ERROR: ADDRESS NOT INVALIDATED BY PARITY TRAP
 7663  055526  054226                                  DH7      ;PC=/P ADDH/P ADDL
 7664  055530  055020                                  DT5      ;$ERRPC,$REG1,$REG2
 7665  055532  000000                                  0
 7666                                                ;ITEM 45
 7667  055534  046023                                  EM45     ;ERROR: TAG PARITY ERROR WHEN TESTING TAG P BIT
 7668  055536  054725                                  DH45     ;PC= /P ADDH/P ADDL/DATA IS
 7669  055540  055030                                  DT12     ;$ERRPC, $REG1, $REG2, $REG3
 7670  055542  000000                                  0
 7671                                                ;ITEM 46
 7672  055544  046102                                  EM46     ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING TAG P BIT
```



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 7673  055546  054725                                  DH45     ;PC=/P ADDH/P ADDL/DATA=
 7674  055550  055030                                  DT12     ;$ERRPC, $REG1, $REG2, $REG3
 7675  055552  000000                                  0
 7676                                                ;ITEM 47
 7677  055554  046173                                  EM47     ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING TAG P BIT
 7678  055556  054725                                  DH45     ;PC=/P ADDH/P ADDL/DATA=
 7679  055560  055030                                  DT12     ;$ERRPC, $REG1, $REG2, $REG3
 7680  055562  000000                                  0
 7681                                                ;ITEM 50
 7682  055564  046260                                  EM50     ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA P BIT
 7683  055566  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7684  055570  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7685  055572  000000                                  0
 7686                                                ;ITEM 51
 7687  055574  046346                                  EM51     ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA P BIT
 7688  055576  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7689  055600  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7690  055602  000000                                  0
 7691                                                ;ITEM 52
 7692  055604  046433                                  EM52     ;ERROR: TAG PARITY ERROR WHEN TESTING TAG ADDR. BITS
 7693  055606  054601                                  DH30     ;PC=/P ADDH/P ADDL/(TAG)/(TAG) SHOULD BE
 7694  055610  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7695  055612  000000                                  0
 7696                                                ;ITEM 53
 7697  055614  046521                                  EM53     ;ERROR: LOW BYTE PAR. ERROR WHEN TESTING TAG ADDR. BITS
 7698  055616  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7699  055620  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7700  055622  000000                                  0
 7701                                                ;ITEM 54
 7702  055624  046614                                  EM54     ;ERROR: HIGH BYTE PAR. ERROR WHEN TESTING TAG ADDR. BITS
 7703  055626  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7704  055630  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7705  055632  000000                                  0
 7706                                                ;ITEM 55
 7707  055634  046710                                  EM55     ;ERROR: TEST OF TAG ADDR. BITS FAILED
 7708                                                           ;       ADDR. COULD NOT BE MADE A HIT
 7709  055636  054535                                  DH27     ;PC=/P ADDH/P ADDL/(TAG) SHOULD=
 7710  055640  055030                                  DT12     ;$ERRPC, $REG1, $REG2, $REG3
 7711  055642  000000                                  0
 7712                                                ;ITEM 56
 7713  055644  047027                                  EM56     ;ERROR: LOW BYTE PARITY ERROR WHEN TESTING DATA FIELD
 7714  055646  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7715  055650  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7716  055652  000000                                  0
 7717                                                ;ITEM 57
 7718  055654  047114                                  EM57     ;ERROR: HIGH BYTE PARITY ERROR WHEN TESTING DATA FIELD
 7719  055656  054256                                  DH11     ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
 7720  055660  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7721  055662  000000                                  0
 7722                                                ;ITEM 60
 7723  055664  047202                                  EM60     ;ERROR: TAG PARITY ERROR WHEN TESTING DATA FIELD
 7724  055666  054601                                  DH30     ;PC=/P ADDH/P ADDL/(TAG)/(TAG) SHOULD BE
 7725  055670  055004                                  DT1      ;$ERRPC,$REG1,$REG2,$REG3
 7726  055672  000000                                  0
 7727                                                ;ITEM 61
 7728  055674  047262                                  EM61     ;ERROR: CACHE DATA LOC HELD WRONG DATA
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7729  055676  054256                    DH11                    ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
7730  055700  055004                    DT1                     ;$ERRPC,$REG1,$REG2,$REG3
7731  055702  000000                    0
7732                                ;ITEM 62
7733  055704  047330                    EM62                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  DATA FIELD FAILED
7734                                                            ;       ADDRESS COULD NOT BE MADE A HIT
7735  055706  054226                    DH7                     ;PC=/P ADDH/P ADDL
7736  055710  055020                    DT5                     ;$ERRPC,$REG1,$REG2
7737  055712  000000                    0
7738                                ;ITEM 63
7739  055714  047470                    EM63                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  DATA FIELD FAILED
7740                                                            ;       ADDRESS HELD WRONG DATA
7741  055716  054256                    DH11                    ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
7742  055720  055004                    DT1                     ;$ERRPC,$REG1,$REG2,$REG3
7743  055722  000000                    0
7744                                ;ITEM 64
7745  055724  047622                    EM64                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  DATA FIELD FAILED
7746                                                            ;       PARITY ERROR LOW BYTE
7747  055726  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7748  055730  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7749  055732  000000                    0
7750                                ;ITEM 65
7751  055734  047752                    EM65                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  DATA FIELD FAILED
7752                                                            ;       PARITY ERROR HIGH BYTE
7753  055736  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7754  055740  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $PEG3
7755  055742  000000                    0
7756                                ;ITEM 66
7757  055744  050103                    EM66                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  DATA FIELD FAILED
7758                                                            ;       PARITY ERROR TAG
7759  055746  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7760  055750  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7761  055752  000000                    0
7762                                ;ITEM 67
7763  055754  050226                    EM67                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  TAG FIELD FAILED
7764                                                            ;       ADDRESS COULD NOT BE MADE A HIT
7765  055756  054226                    DH7                     ;PC=/P ADDH/P ADDL
7766  055760  055020                    DT5                     ;$ERRPC,$REG1,$REG2
7767  055762  000000                    0
7768                                ;ITEM 70
7769  055764  050373                    EM70                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  TAG FIELD FAILED
7770                                                            ;       TAG PARITY ERROR
7771  055766  054472                    DH22                    ;PC=/P ADDH/P ADDL/TAG FIELD=
7772  055770  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7773  055772  000000                    0
7774                                ;ITEM 71
7775  055774  050521                    EM71                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  TAG FIELD FAILED
7776                                                            ;       LOW BYTE PARITY ERROR
7777  055776  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7778  056000  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7779  056002  000000                    0
7780                                ;ITEM 72
7781  056004  050654                    EM72                    ;ERROR: TEST OF MSB ADDRESS (A10) TO  TAG FIELD FAILED
7782                                                            ;       HIGH BYTE PARITY ERROR
7783  056006  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7784  056010  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
```



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7785  056012  000000                    0
7786                                ;ITEM 73
7787  056014  051010                    EM73                    ;ERROR: DYNAMIC TEST OF CACHE FAILED
7788                                                            ;       LOC HELD WRONG DATA
7789  056016  054256                    DH11                    ;PC=/P ADDH/P ADDL/DATA IS/DATA SHOULD BE
7790  056020  055004                    DT1                     ;$ERRPC,$REG1,$REG2,$REG3
7791  056022  000000                    0
7792                                ;ITEM 74
7793  056024  051106                    EM74                    ;ERROR: DYNAMIC TEST OF CACHE FAILED
7794                                                            ;       TRAP TO 10 OCCURRED
7795  056026  053775                    DH1                     ;PC=/P ADDH/P ADDL/PC OF PE
7796  056030  055004                    DT1                     ;$ERRPC,$REG1,$REG2,$REG3
7797  056032  000000                    0
7798                                ;ITEM 75
7799  056034  051204                    EM75                    ;ERROR: DYNAMIC TEST OF CACHE FAILED
7800                                                            ;       LOW BYTE PARITY ERROR
7801  056036  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7802  056040  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7803  056042  000000                    0
7804                                ;ITEM 76
7805  056044  051304                    EM76                    ;ERROR: DYNAMIC TEST OF CACHE FAILED
7806                                                            ;       HIGH BYTE PARITY ERROR
7807  056046  054725                    DH45                    ;PC=/P ADDH/P ADDL/DATA=
7808  056050  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7809  056052  000000                    0
7810                                ;ITEM 77
7811  056054  051405                    EM77                    ;ERROR: DYNAMIC TEST OF CACHE FAILED
7812                                                            ;       TAG PARITY ERROR
7813  056056  054472                    DH22                    ;PC=/P ADDH/P ADDL/TAG FIELD=
7814  056060  055030                    DT12                    ;$ERRPC, $REG1, $REG2, $REG3
7815  056062  000000                    0
7816                                ;ITEM 100
7817  056064  000000                    0
7818  056066  000000                    0
7819  056070  000000                    0
7820  056072  000000                    0
7821                                ;ITEM 101
7822  056074  051500                    EM101                   ;ERROR: CACHE CONTROL REG NOT INITIALIZED BY POWER FAIL
7823  056076  054763                    DH100                   ;PC=/DATA=
7824  056100  055062                    DT100                   ;$ERRPC,$REG1
7825  056102  000000                    0
7826                                ;ITEM 102
7827  056104  051566                    EM102                   ;ERROR: POWER UP FAILED TO INVALIDATE CACHE
7828  056106  055000                    DH107                   ;PC=
7829  056110  055070                    DT107                   ;$ERRPC
7830  056112  000000                    0
7831                                ;ITEM 103
7832  056114  051640                    EM103                   ;ERROR: DEVICE ERROR BIT SET WHEN DOING NPR,DATO TO ADDR
7833  056116  054226                    DH7                     ;PC=/P ADDH/P ADDL
7834  056120  055020                    DT5                     ;$ERRPC,$REG1,$REG2
7835  056122  000000                    0
7836                                ;ITEM 104
7837  056124  051733                    EM104                   ;ERROR: CACHE LOC NOT INVALIDATED BY NPR, DATO
7838  056126  054226                    DH7                     ;PC=/P ADDH/P ADDL
7839  056130  055020                    DT5                     ;$ERRPC,$REG1,$REG2
7840  056132  000000                    0
```

```
                                ;ITEM 105
                                        EM105                   ;ERROR: DID NOT GET PARITY TRAP WHEN DID NPR
                                                                ;       DATO TO ADDR, WRITTEN WITH WRONG PARITY
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
                                ;ITEM 106
                                        0
                                        0
                                        0
                                        0
                                ;ITEM 107
                                        EM107                   ;ERROR: CACHE DID NOT TRACK WHEN FORCE MISS ON
                                        DH107                   ;PC=
                                        DT107                   ;$ERRPC
                                        0
                                ;ITEM 110
                                        EM110                   ;ERROR: RETRY TO BACKING STORE NOT DONE ON CACHE PARITY
                                        DH107                   ;PC=
                                        DT107                   ;$ERRPC
                                        0
                                ;ITEM 111
                                        EM111                   ;ERROR: TEST OF VALID BIT FAILED
                                                                ;       LOC COULD NOT BE MADE A HIT
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
                                ;ITEM 112
                                        EM112                   ;ERROR: TEST OF VALID BIT FAILED
                                                                ;       LOC NOT INVALIDATED BY P TRAP
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
                                ;ITEM 113
                                        EM113                   ;ERROR: ADDR, NOT INVALIDATED BY CONSOLE SWEEP
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
                                ;ITEM 114
                                        EM114                   ;ERROR: LOC WRITTEN WITH WRONG PARITY NOT
                                                                ;       INVALIDATED VIA NPR DATO
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
                                ;ITEM 115
                                        EM115                   ;ERROR: PARITY TRAP WHILE TESTING LOC
                                                                ;       WRITTEN WITH WRONG PARITY AND
                                                                ;       INVALIDATING VIA NPR DATO
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
                                ;ITEM 116
                                        EM116                   ;ERROR: CACHE ALLOCATED DURING ODD ADDRESS TRAP
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0
```



```
                                ;ITEM 117
                                        EM117                   ;ERROR: CACHE ALLOCATED DURING RED ZONE TRAP
                                        DH107                   ;PC=
                                        DT107                   ;$ERRPC
                                        0
                                ;ITEM 120
                                        EM120                   ;ERROR: CACHE ALLOCATED DURING KT ABORT
                                        DH107                   ;PC=
                                        DT107                   ;$ERRPC
                                        0
                                ;ITEM 121
                                        EM121                   ;ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED
                                                                ;       LOC NOT INVALIDATED
                                        DH7                     ;PC=/P ADDH/P ADDL
                                        DT5                     ;$ERRPC,$REG1,$REG2
                                        0

                                ;ITEM 122
                                        EM122                   ;ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED
                                                                ;       PARITY ERROR TAG
                                        DH45                    ;PC=/P ADDH/P ADDL/DATA=
                                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
                                        0
                                ;ITEM 123
                                        EM123                   ;ERROR:TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED
                                                                ;       PARITY ERROR LOW BYTE
                                        DH45                    ;PC=/P ADDH/P ADDL/DATA=
                                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
                                        0
                                ;ITEM 124
                                        EM124                   ;ERROR: TEST OF MSB ADDRESS (A10) TO VALID BIT FAILED
                                                                ;       PARITY ERROR HIGH BYTE
                                        DH45                    ;PC=/P ADDH/P ADDL/DATA=
                                        DT12                    ;$ERRPC,$REG1,$REG2,$REG3
                                        0
                                ;;*****************************************************************
                                ;TEST BUFFER
                                ;;*****************************************************************
                                        .END
```

```
ABASE = 000000            458     499
ACDW1 = 000000            458     501
ACDW2 = 000000            458     502
ACPUOP= 000000            458     473
ADDW0 = 000000            458     503
ADDW1 = 000000            458     504
ADDW10= 000000            458     513
ADDW11= 000000            458     514
ADDW12= 000000            458     515
ADDW13= 000000            458     516
ADDW14= 000000            458     517
ADDW15= 000000            458     518
ADDW2 = 000000            458     505
ADDW3 = 000000            458     506
ADDW4 = 000000            458     507
ADDW5 = 000000            458     508
ADDW6 = 000000            458     509
ADDW7 = 000000            458     510
ADDW8 = 000000            458     511
ADDW9 = 000000            458     512
ADD1H   031622           4918#   4921#   4997    5003
ADD1L   031620           4917#   4920#   4930    4939    4956*   4957*   4962*   4963*   4971*   4972*   4984    4998    5004
ADD2H   032444           5071#   5075#   5125    5131
ADD2L   032442           5072#   5074#   5084    5126    5132
ADEVCT= 000000            458     464
ADEVM = 000000            458     500
AENV  = 000000            458     469
AENVM = 000000            458     470
AFATAL= 000000            458     461
AMADR1= 000000            458     486
AMADR2= 000000            458     490
AMADR3= 000000            458     493
AMADR4= 000000            458     496
AMAMS1= 000000            458     480
AMAMS2= 000000            458     488
AMAMS3= 000000            458     491
AMAMS4= 000000            458     494
AMSGAD= 000000            458     466
AMSGLG= 000000            458     467
AMSGTY= 000000            458     460
AMTYP1= 000000            458     481
AMTYP2= 000000            458     489
AMTYP3= 000000            458     492
AMTYP4= 000000            458     495
APASS = 000000            458     463
APRIOR= 000000            458
APTCSU= 000040           5901    6006#
APTENV= 000001           5641    5894    5962    6004#
APTSIZ= 0002W0            612    6003#
APTSPO= 000100           5896    5964    6005#
ASWREG= 000000            458     471
ATESTN= 000000            458     462
AUNIT = 000000            458     465
AUSWR = 000000            458     472
AVECT1= 000000            458     497
AVECT2= 000000            458     498
```



```
A1      003402            938     945#   1031    1039    1047
A10     003706           1013    1019#
A11     003752           1030    1033#
A12     003730           1020    1027#
A13     004002           1038    1041#
A14     004052           1034    1055#
A15     003214            900     902#
A16     003250            909     911#
A17     004054            910     985    1005    1059#
A3      003312            917     922#
A4      003334            918     927     932#
A5      003300            916#    928
A6      003360            935     937#
A77     003550            936     942     989#
AR      003346            934#    943
AR0     003604            992     996#
AR1     003606            994     997#
AR2     003616            995     999#
AR5     004042           1042    1053#
AR6     004032           1046    1051#
BIT0  = 000001            124#
BIT00 = 000001            114#    124
BIT01 = 000002            113#    123
BIT02 = 000004            112#    122
BIT03 = 000010            111#    121
BIT04 = 000020            110#    120
BIT05 = 000040            109#    119
BIT06 = 000100            108#    118
BIT07 = 000200            107#    117
BIT08 = 000400            106#    116
BIT09 = 001000            105#    115    5584    5651
BIT1  = 000002            123#
BIT10 = 002000            104#   5629
BIT11 = 004000            103#   5591
BIT12 = 010000            102#
BIT13 = 020000            101#   5636
BIT14 = 040000            100#   5566
BIT15 = 100000             99#
BIT2  = 000004            122#
BIT3  = 000010            121#
BIT4  = 000020            120#
BIT5  = 000040            119#
BIT6  = 000100            118#
BIT7  = 000200            117#
BIT8  = 000400            116#
BIT9  = 001000            115#
BPTVEC= 000014            131#
BSD   = 055016            294#   3552    3722
BUFH  = 062000            296#   1124    1156    1211    1241    1243    1271*   1272    1277    1281*   1282*   1283    1286
                         1292    1294    1297    1303*   1304*   1305    1307    1310    1331*   1332    1337    1834    1840
                         1844    1888    1892*   1894    1942*   1943    2511    2520    2548    2557    2563    2584    2597
                         2629    2702    2709    2710    2713    2714    2733    3158    3163    3653    5351
BUFL  = 060000            295#    296     844    1120    1380    1386    1526*   1528    1537    1560*   1562    2031    2039
                         2045    2047    2072    2081    2087    2108    2121    2127    2129    2158    2232    2239    2246
                         2243    2244    2263    2372    2377    3018    3098    3483    4219*   4220*   4232    4242    4248
                         4325    4330*   4344    4356    4396    4409    4410    4420    4421    4598*   4600    4613    4634
```

```
                    4701    4803*   4917    4957    4963    4972    5347    5546    5548
B1          001734   641     645#
B2          001710   636#    643
CCR     = 177746    286#    354*    646*    896*   1103*   1105*   1107    1142*   1145*   1146    1149*   1162*   1188*
                   1195*   1207*   1210*   1213*   1217    1233*   1236*   1240*   1242*   1247*   1251*   1266*   1269*
                   1275*   1286*   1295*   1301*   1308*   1324*   1327*   1335*   1341*   1346*   1367*   1370*   1371
                   1374*   1384*   1390*   1394    1421*   1457*   1469*   1475*   1484*   1512*   1516*   1517    1520*
                   1524*   1527*   1532*   1544*   1559*   1561*   1567*   1576*   1618*   1633*   1636*   1641*   1659*
                   1728*   1736*   1745*   1830*   1839*   1841*   1843*   1845*   1851*   1891*   1893*   1896*   1901*
                   1941*   1949*   1981*   2026*   2030*   2054*   2056*   2088*   2090*   2092*   2116*   2135*   2139*
                   2141*   2143*   2164*   2172*   2178*   2185*   2191*   2227*   2233*   2261*   2269*   2326*   2330*
                   2364*   2370*   2393*   2409*   2412*   2418*   2507*   2510*   2524*   2530*   2532*   2564*   2566*
                   2568*   2592*   2606*   2610*   2612*   2614*   2635*   2642*   2648*   2655*   2661*   2697*   2703*
                   2731*   2739*   2796*   2800*   2807*   2844*   2875*   2907*   2975*   2987*   3012*   3019*   3040*
                   3081*   3107*   3117*   3150*   3156*   3179*   3193*   3249*   3289*   3320*   3352*   3420*   3432*
                   3441*   3475*   3481*   3523*   3591*   3598*   3603*   3611*   3645*   3651*   3693*   3761*   3768*
                   3773*   3799*   3806*   3808*   3833*   3840*   3847*   3853*   3859*   3947*   3977*   3992*   3996*
                   4004*   4088*   4096*   4114*   4122*   4126*   4131*   4139*   4214*   4217*   4240*   4246    4262*
                   4265*   4292*   4298*   4316*   4329*   4354*   4360*   4386*   4392*   4456*   4485*   4510*   4519*
                   4590*   4594*   4595    4597*   4599*   4616*   4619*   4626    4627*   4632*   4640*   4658*   4661*
                   4697*   4700*   4737*   4744*   4772*   4779*   4808    4822*   4831*   4906*   4912*   5039*   5048*
                   5192*   5251*
CDH     = 000106    287#    1796    1877    1927    2321    2457    2791    2970    3087    3232    3415    3573    3743
                   3909    4054    4559    5213
CDL     = 000106    288#    1785    1868    1916    2314    2465    2784    2963    3075    3240    3408    3565    3735
                   3901    4046    4170    4179    4550    5233
CER     = 177766    291#    5253
CR      = 000015     39#     334#   5940    5950    6342    6348    6356    6363    6368    6373    6378    6384    6391
                   6396    6403    6409    6414    6420    6427    6432    6438    7170    7205    7217    7230    7250
                   7291    7305    7318    7332
CREG1   001212     444#    690*    696     711*    743*    785*    834*    4914    5052    5373    5385*
CREG2   001214     445#    695*    741*    746     781*    782*    836*    837*    841     4782*   4796*   5386*   5390*
                   5440    5490    5512    5528
CREG3   001216     446#    692*    5384*
CREG4   001220     447#    688*    5388*
CREG5   001222     448#    686*    5387*
CREG6   001224     449#    684*
CRLF    = 000200    40#    5911    5950
CTAG    = 000107    289#   3095
DDISP   = 177570     46#    418     600
DH1         053775  7347#   7476    7795
DH100       054763  7438#   7823
DH107       055000  7441#   7828    7854    7859    7899    7904
DH11        054256  7379#   7516    7552    7606    7612    7630    7636    7642    7648    7683    7688    7698    7703
                   7714    7719    7729    7741    7789
DH12        054336  7387#   7521
DH16        054376  7393#   7541
DH2         054036  7353#   7481    7486    7491
DH21        054433  7398#   7557
DH22        054472  7404#   7562    7567    7771    7813
DH27        054535  7410#   7588    7709
DH30        054601  7417#   7594    7600    7618    7693    7724
DH35        054660  7425#   7624
DH45        054725  7432#   7668    7673    7678    7747    7753    7759    7777    7783    7801    7807    7916    7922
                   7928
DH5         054105  7360#   7496    7501    7582
```



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DH6         054144  7366#   7526
DH7         054226  7375#   7506    7511    7531    7546    7577    7653    7658    7663    7735    7765    7833    7838
                   7844    7865    7871    7876    7882    7889    7894    7910
DISPLA      001136   418#    600*    608*   5606*   5628*
DISPRE      000174   345#    608
DSWR    = 177570     45#    417     599
DT1         055004  7443#   7482    7487    7492    7517    7553    7595    7601    7607    7613    7619    7631    7637
                   7643    7649    7684    7689    7694    7699    7704    7715    7720    7725    7730    7742    7790
                   7796
DT100       055062  7452#   7824
DT107       055070  7453#   7829    7855    7860    7900    7905
DT12        055030  7447#   7477    7522    7558    7563    7568    7589    7669    7674    7679    7710    7748    7754
                   7760    7772    7778    7784    7802    7808    7814    7917    7923    7929
DT16        055042  7449#
DT35        055050  7450#   7625
DT5         055020  7445#   7497    7502    7507    7512    7527    7532    7542    7547    7578    7583    7654    7659
                   7664    7736    7766    7834    7839    7845    7866    7872    7877    7883    7890    7895    7911
EAD         001230   451#    696*    712*    744*    786*    835*   4949    5005    5103    5133
EMTVEC= 000030    134#    583*    584*
EM1         041752  6446#   7475
EM10        042460  6503#   7510
EM101       051500  7133#   7822
EM102       051566  7142#   7827
EM103       051640  7149#   7832
EM104       051733  7159#   7837
EM105       052030  7170#   7842
EM107       052165  7187#   7853
EM11        042541  6512#   7515
EM110       052242  7195#   7858
EM111       052335  7205#   7863
EM112       052437  7217#   7869
EM113       052550  7230#   7875
EM114       052631  7239#   7880
EM115       052732  7250#   7886
EM116       053100  7268#   7893
EM117       053156  7276#   7898
EM12        042623  6521#   7520
EM120       053231  7284#   7903
EM121       053277  7291#   7908
EM122       053416  7305#   7914
EM123       053532  7318#   7920
EM124       053653  7332#   7926
EM14        042676  6529#   7530
EM16        042770  6539#   7540
EM17        043033  6545#   7545
EM2         042032  6454#   7480
EM20        043114  6554#   7550
EM21        043221  6566#   7556
EM22        043316  6577#   7561
EM23        043410  6587#   7566
EM24        043501  6597#   7571
EM25        043560  6605#   7576
EM26        043633  6613#   7581
EM27        043703  6620#   7586    7592
EM3         042106  6462#   7485
EM31        044073  6641#   7598
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EM32    044235          6658#   7604
EM33    044365          6674#   7610
EM34    044514          6689#   7616
EM35    044637          6704#   7622
EM36    045000          6721#   7628
EM37    045157          6740#   7634
EM4     042167          6471#   7490
EM40    045337          6760#   7640
EM41    045462          6775#   7646
EM42    045606          6790#   7652
EM43    045676          6800#   7657
EM44    045745          6807#   7662
EM45    046023          6815#   7667
EM46    046102          6823#   7672
EM47    046173          6833#   7677
EM5     042251          6480#   7495
EM50    046260          6842#   7682
EM51    046346          6851#   7687
EM52    046433          6860#   7692
EM53    046521          6870#   7697
EM54    046614          6880#   7702
EM55    046710          6890#   7707
EM56    047027          6904#   7713
EM57    047114          6913#   7718
EM6     042330          6488#   7500    7525
EM60    047202          6922#   7723
EM61    047262          6930#   7728
EM62    047330          6937#   7733
EM63    047470          6953#   7739
EM64    047622          6968#   7745
EM65    047752          6983#   7751
EM66    050103          6998#   7757
EM67    050226          7013#   7763
EM7     042402          6495#   7505
EM70    050373          7031#   7769
EM71    050521          7046#   7775
EM72    050654          7062#   7781
EM73    051010          7078#   7787
EM74    051106          7089#   7793
EM75    051204          7100#   7799
EM76    051304          7111#   7805
EM77    051405          7122#   7811
EREG  = 177744            290#  1074    1673    1767    1782    1793    1864    1874    1912    1923    1965    1972    2301
                         2311   2436    2454    2462    2771    2781    2942    2960    3072    3084    3211    3229    3237
                         3387   3405    3562    3570    3732    3740    3887    3898    4032    4043    4167    4176    4547
                         4556   5208    5210
ERRVEC= 000004            127#   597     598*    609*   5571    5572*   5574*   5577*   5733    5734    5740*   5748*   5760*
                         5765*  5774*   5784*   5785*
FAKE    034224            712   5404#
GNS   = ****** U          344   6270    6271    6272    6273    6274    6277    6278    6279
HAD     033714           3803   4092    5341#
HIADD = 000101            292#  1067
HMR   = 177752            285#  1114    1122    1126    1155    1215    1238    1244    1273    1284    1329    1333    1382
                         1392   1473    1482    2036    2050    2077    2114    2133    2246    2253    2383    2395    2517
                         2526   2553    2590    2604    2716    2723    2882    2891    3169    3181    3327    3336    3492
                         3506   3662    3676    3825    3828    3980    3983    4100    4105    4233    4283    4345    4614
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                         4671   4681    4722    4733    4941    4947    4986    4992    5095    5101    5114    5120
HMR0  = 000001            328#
HMR1  = 000002            329#  1163
HMR2  = 000004            330#  1170    1215    1238    1244    1273    1284    1329    1333    1382    1392    1473    1482
                         2036   2050    2077    2114    2133    2246    2253    2383    2395    2517    2526    2553    2590
                         2604   2716    2723    2882    2891    3169    3181    3327    3336    3492    3506    3662    3676
                         3825   3828    3980    3983    4100    4105    4233    4283    4345    4614    4671    4681    4722
                         4733   4941    4947    4986    4992    5095    5101    5114    5120
HMR3  = 000010            331#  1176
HMR4  = 000020            332#  1182
HMR5  = 000040            333#  1193
HRK05   034226            745   5411#
HRP03   034460            787   5459#
HT    = 000011             37#  5909    5950
HTU10   034714            833   5508#
HUBFN   034046            697    872    4975    5140    5358    5372#
HUBEO   034174            713   5107    5399#
IOTVEC= 000020            132#   581*    582*
IVEC    001226            450#   683*    874     876*   4977    5142    5144*   5360    5362*
KDPAR0= 172360            275#
KDPAR1= 172362            276#
KDPAR2= 172364            277#
KDPAR3= 172366            278#
KDPAR4= 172370            279#
KDPAR5= 172372            280#
KDPAR6= 172374            281#
KDPAR7= 172376            282#
KDPDR0= 172320            253#
KDPDR1= 172322            254#
KDPDR2= 172324            255#
KDPDR3= 172326            256#
KDPDR4= 172330            257#
KDPDR5= 172332            258#
KDPDR6= 172334            259#
KDPDR7= 172336            260#
KIPAR0= 172340            264#   962    4669*   4679*   5288    5334    5752
KIPAR1= 172342            265#
KIPAR2= 172344            266#
KIPAR3= 172346            267#  4328
KIPAR4= 172350            268#   914*    916     925*    926     933*    934     940*    941     989*    997*    999*   1008*
                         1014*  1021*   1027*   1036*   1044*   1052*   1054*   1429    1441    1443*   1446*   1447    1449
                         1451   1460    1470    1628*   1630    1647    1688    1697    1722*   1733*   1734    1739*   1774
                         2853*  3298*   3966*   3988*   4328*   4459    5059*   5060    5062*   5063    5105    5109
KIPAR5= 172352            269#  1437    1439    1453*   1456*   1470    1490    1493*   1495*   2867*   3312*   3965*   3989*
                         4460
KIPAR6= 172354            270#
KIPAR7= 172356            271#  5768
KIPDR0= 172300            242#
KIPDR1= 172302            243#
KIPDR2= 172304            244#
KIPDR3= 172306            245#
KIPDR4= 172310            246#   913*   1430    1627*   4324*   4350*
KIPDR5= 172312            247#
KIPDR6= 172314            248#  1433
KIPDR7= 172316            249#
LAST1   025746           3970   4063#
```

```
LF     = 000012          38#   335#  5944  5950  6342  6348  6356  6363  6368  6373  6378  6384  6391
                       6396  6403  6409  6414  6420  6427  6432  6438  7170  7205  7217  7230  7250
                       7291  7305  7318  7332
LOADD  = 000102         293#  1070  1676  1707  1765  2288  2434  2758  2927  3060  3209  3372  3543
                       3713  3878  4023  4158  4495  4538  4854  5202
LOC    = 000200         348#   356
MED    = 076600         297#   865   868  1066  1069  1080  1083  1550  1553  1586  1589  1665  1668
                       1675  1678  1683  1699  1706  1709  1751  1754  1759  1764  1769  1784  1795
                       1854  1857  1867  1876  1904  1907  1915  1926  1952  1955  1961  2063  2066
                       2099  2102  2151  2154  2275  2278  2282  2287  2290  2303  2313  2320  2421
                       2424  2428  2433  2440  2456  2464  2539  2542  2575  2578  2622  2625  2745
                       2748  2752  2757  2760  2773  2783  2790  2910  2913  2921  2926  2929  2952
                       2962  2969  3043  3046  3054  3059  3062  3074  3086  3094  3196  3199  3203
                       3208  3215  3231  3239  3355  3358  3366  3371  3374  3397  3407  3414  3526
                       3529  3537  3542  3545  3551  3564  3572  3583  3696  3699  3707  3712  3715
                       3721  3734  3742  3753  3815  3818  3862  3865  3872  3877  3880  3889  3900
                       3908  4007  4010  4017  4022  4025  4034  4045  4053  4142  4145  4152  4157
                       4160  4169  4178  4186  4225  4228  4275  4278  4337  4340  4489  4494  4499
                       4502  4522  4525  4532  4537  4540  4549  4558  4566  4606  4609  4719  4730
                       4799  4815  4818  4834  4837  4844  4848  4853  5196  5201  5204  5212  5223
                       5232  5240  5243  5260  5263  5794  5797
MMR0   = 177572         308#   861*  915*  1059* 1077* 1468* 1478* 1487* 1498* 1629* 1808* 2874* 2995*
                       3319*  3439* 3976*  4059* 4331* 4349* 4464* 4574* 5053* 5139* 5382* 5416* 5461*
                       5474*  5521*
MMR2   = 177576         309#
MMVEC  = 000250         143#
MSG1     040542         616   6327#
MSG10    041507         822   6414#
MSG11    041546         827   6420#
MSG12    041614         855   5464   6427#
MSG13    041645         753    850   5379  5419  5477  5524  6432#
MSG14    041705        5380   5420  5465  5478  5525  6438#
MSG2     040625        4785   6336#
MSG3     040670         635   6342#
MSG4     041202         642    671    733   775   807  6378#
MSG5     041242         660   6384#
MSG6     041312         670    708    725   767   799  6391#
MSG7     041414         728    770    802  6403#
MTBRC  = 172524         326#   843*  5511* 5530*
MTC    = 172522         325#   795   813*  816*  817*  830*  834   835   841*  842*  845*  853   5508*
                       5512*  5513* 5514*  5528* 5529* 5539*
MTCMA  = 172526         327#   844*  5531*
MTS    = 172520         324#   820   825   831   847  5516
NSSYN    004072         902   1065#
PAR      033634        2944   2948  2979  2990  3389  3393  3424  3435  5325#
PIRQ   = 177772          44#
PIRQVE= 000240          138#
PR0    = 000000          61#
PR1    = 000040          62#
PR2    = 000100          63#
PR3    = 000140          64#
PR4    = 000200          65#
PR5    = 000240          66#
PR6    = 000300          67#
PR7    = 000340          68#
PS     = 177776          41#    42
```



```
PSW    = 177776          42#  5364*
PVEC   = 000114         310#  1515*  1558*  1593*  1626*  1732*  1833*  1887*  1939*  2043*  2075*  2086*  2111*
                       2126*  2168*  2230*  2336*  2367*  2408*  2523*  2551*  2562*  2587*  2602*  2639*  2700*
                       2806*  2852*  2996*  3015*  3116*  3153*  3254*  3297*  3440*  3478*  3610*  3648*  3780*
                       3802*  3823*  3837*  3953*  4060*  4091*  4194*  4389*  4577*  4593*  4644*  4777*  4827*
PWRVEC= 000024         133#   587*   588*  4778*  4788*  4828*  6284*  6285*  6294*  6300*  6312*  6313*
QRK05    002232         652    720#
QRP03    002412         653    762#
QTU10    002540         654    794#
QUBEN    001764         650    660#
QUBEO    002156         651    704#
Q1       001726         639    642#   709   726   754   768   800
Q2       001704         632    635#   851   856
RDAT   = 000106         302#   1962
RDCHR  = 104406        6133   6277#
RDLIN  = 104407        6205   6278#
RDOCT  = 104410         636    661   730   772   804  6279#
RESVEC= 000010          128#
RJAM   = 000100         298#   2291  2761  2930  3063  3375  3546  3716  3881  4026  4161  4541  4845
                       5205
RKBA   = 177410         315#  5442#
RKCS   = 177404         313#   721   743   744   747*  5412  5431*  5433  5441*  5451*
RKDA   = 177412         316#   746*  5440*
RKDS   = 177400         311#   749   5425
RKER   = 177402         312#
RKWC   = 177406         314#  5439*
RLOG   = 000022         303#   866  1081  1551  1587  1666  1752  1855  1905  1953  2064  2100  2152
                       2276  2422  2540  2576  2623  2746  2911  3044  3197  3356  3527  3697  3816
                       3863  4008  4143  4226  4276  4338  4500  4523  4607  4816  4835  5241  5261
                       5795
RPBA   = 176720         300#   321#  5491*
RPCA   = 176722         322#   783*
RPCS   = 176714         319#   763   785   786  5459  5470  5490*  5500*
RPDA   = 176724         323#   784*
RPDS   = 176710         317#  5483
RPER   = 176712         318#
RPWC   = 176716         320#  5489*
RSER   = 000101         299#  1679  1710  1760  2283  2429  2753  2922  3055  3204  3367  3538  3708
                       3873  4018  4153  4490  4533  4849  5197
RTAG   = 000107         301#  1684  1700  1770  2304  2441  2774  2953  3216  3398  3584  3754  3890
                       4035  4187  4567  5224
SDPAR0= 172260          231#
SDPAR1= 172262          232#
SDPAR2= 172264          233#
SDPAR3= 172266          234#
SDPAR4= 172270          235#
SDPAR5= 172272          236#
SDPAR6= 172274          237#
SDPAR7= 172276          238#
SDPDR0= 172220          209#
SDPDR1= 172222          210#
SDPDR2= 172224          211#
SDPDR3= 172226          212#
SDPDR4= 172230          213#
SDPDR5= 172232          214#
SDPDR6= 172234          215#
```

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SDPDR7= 172236           216#
SETUP   001232           452#   697*   713*   745*   787*   833*   872   4919   4975   5073   5107   5140   5358
SIPAR0= 172240           220#
SIPAR1= 172242           221#
SIPAR2= 172244           222#
SIPAR3= 172246           223#
SIPAR4= 172250           224#
SIPAR5= 172252           225#
SIPAR6= 172254           226#
SIPAR7= 172256           227#
SIPDR0= 172200           198#
SIPDR1= 172202           199#
SIPDR2= 172204           200#
SIPDR3= 172206           201#
SIPDR4= 172210           202#
SIPDR5= 172212           203#
SIPDR6= 172214           204#
SIPDR7= 172216           205#
SKTST   001234           453#   898*  1106*  1144*  1209*  1235*  1268*  1326*  1369*  1423*  1514*  1620*  1832*
                        2028*  2229*  2366*  2509*  2699*  2846*  3014*  3152*  3291*  3477*  3647*  3801*  3949*
                        4090*  4216*  4264*  4318*  4388*  4592*  4660*  4699*  4774*  4908*  5041*  5247
SR0     = 177572         147#   308    5749   5764*  5771*
SR1     = 177574         148#
SR2     = 177576         149#   309
SR3     = 172516         150#  5761*
STACK   = 001100          32#   579    862    982   2169   4793
START   001362           355    572#
START1  003056           633    698    714    756    788    854    859#   5182
STKLMT= 177774            43#
SWEEP   035134          1533   1545   1568   1577   1642   1660   1729   1746   1982   2165   2270   2636   2740
                        3834   4620   4641   5546#
SWR     001134           417#   577    599*   601    607*   614*   626    628    631    899   1424   1621   2847
                        3292   3950   4319   4450   4775   4790   4909   5042   5045   5254   5377   5417   5462
                        5475   5522   5566   5584   5591   5629   5636   5648   5651   6292  6305*
SWREG   000176           346#   607
SW0     = 000001          96#
SW00    = 000001          86#    96
SW01    = 000002          85#    95
SW02    = 000004          84#    94
SW03    = 000010          83#    93
SW04    = 000020          82#    92
SW05    = 000040          81#    91
SW06    = 000100          80#    90
SW07    = 000200          79#    89    628   4775
SW08    = 000400          78#    88    626    631   4909   5042
SW09    = 001000          77#    87   5254
SW1     = 000002          95#
SW10    = 002000          76#
SW11    = 004000          75#
SW12    = 010000          74#   899   1424   1621   2847   3292   3950   4319   4450   5045
SW13    = 020000          73#  5377   5417   5462   5475   5522
SW14    = 040000          72#
SW15    = 100000          71#
SW2     = 000004          94#
SW3     = 000010          93#
SW4     = 000020          92#
```



```
SW5     = 000040          91#
SW6     = 000100          90#
SW7     = 000200          89#
SW8     = 000400          88#
SW9     = 001000          87#
TAB     001752           648    650#
TAD1    026442          4093   4097*  4099   4115   4203#
TAD2    025242          3804   3824   3849   3915#
TAG     033606          1648   1689   1698   1775   2950   2981   3395   3426   5313#
TBITVE= 000014           129#
TKVEC   = 000060           136#
TPAT    026432          4097   4098   4102   4107   4109   4127   4132   4198#
TPVEC   = 000064           137#
TRAPVE= 000034           135#   585*   586*  5737   5738*  5743*
TRTVEC= 000014           130#
TST1    003162           896#

TST10   006000          1326   1347   1367#
TST11   006166          1369   1388   1393   1421#
TST12   006626          1423   1426   1479   1488   1512#
TST13   007140          1514   1594   1618#
TST14   010230          1620   1623   1830#
TST15   012000          1832   1986   2026#
TST16   012734          2028   2170   2227#
TST17   013406          2229   2364#
TST2    004164           898    901   1061   1103#
TST20   014100          2366   2410   2507#
TST21   015000          2509   2640   2697#
TST22   016000          2699   2808   2844#
TST23   016646          2846   2849   3012#
TST24   020000          3014   3118   3150#
TST25   020456          3152   3289#
TST26   022000          3291   3294   3442   3475#
TST27   024000          3477   3612   3645#
TST3    004320          1106   1142#
TST30   024566          3647   3799#
TST31   025244          3801   3838   3947#
TST32   025750          3949   3952   4061   4088#
TST33   026444          4090   4195   4214#
TST34   026634          4216   4238   4262#
TST35   027030          4264   4290   4316#
TST36   027300          4318   4320   4352   4386#
TST37   030260          4388   4452   4590#
TST4    004616          1144   1194   1207#
TST40   030524          4592   4658#
TST41   030674          4660   4672   4676   4697#
TST42   031132          4699   4726   4743   4772#
TST43   031524          4774   4776   4829   4906#
TST44   032240          4908   4911   4976   4980   5039#
TST5    004712          1209   1216   1233#
TST6    005044          1235   1245   1249   1266#
TST7    005364          1268   1279   1290   1306   1324#
TYPDS   = 104405          5171   6274#
TYPE    = 104401           616    635    642    660    670    671    708    725    728    733    753    767    77
                           775    799    802    807    822    827    850    855   4785   5169   5172   5379   53
                          5419   5420   5464   5465   5477   5478   5524   5525   5631   5639   5673   5690   56
                          5695   5697   5701   5708   5862   5914   6067   6140   6146   6151   6155   6160   61
```

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                        6163    6166    6170    6234    6236    6270#   6314
TYPOC = 104402          5681    5705    6271#
TYPON = 104404          6273#
TYPOS = 104403          6272#
T01L01  004242          1109    1114#
T01L02  004264          1115    1120#
T01L03  004252          1116#   1123    1127
T02L01  004404          1148    1155#
T02L02  004462          1164    1170#
T02L03  004504          1171    1176#
T02L04  004526          1177    1182#
T02L05  004550          1183    1188#
T02L06  004454          1167#   1174    1180    1186    1198
T04L01  005144          1274    1281#
T04L02  005220          1285    1292#
T04L03  005300          1293    1303#
T05L01  005472          1330    1341#
T05L02  005514          1334    1339    1346#
T06L01  006260          1437#   1494    1496
T06L02  006366          1440    1454    1457#
T06L03  006276          1438    1441#   1491
T06L04  006620          1448    1450    1498#
T06L05  006316          1442    1446#
T06L06  006324          1444    1447#
T06L07  006360          1452    1456#
T06L08  006440          1469#   1476    1485
T06L09  006522          1471    1481#
T06L10  006566          1474    1483    1490#
T06L11  006610          1492    1495#
T06L12  006266          1435    1439#
T07L01  007354          1626    1656#
T07L02  007650          1632    1725#
T07L03  007254          1635#
T07L04  007232          1630#   1650    1691    1715    1723
T07L05  010214          1654    1695    1720    1735    1780    1791    1802    1808#
T07L06  007520          1674    1697#
T07L07  007636          1704    1719    1722#
T07L08  007734          1732    1742#
T07L09  007674          1734#   1740    1777    1788    1799    1805
T07L10  010076          1768    1782#
T07L11  010136          1783    1793#
T07L12  010176          1794    1804#
T08L01  010350          1833    1851#
T08L02  011052          1849    1872    1881    1899    1921    1932    1945    1970    1978#
T08L03  010432          1863    1874#
T08L04  010460          1865    1883#
T08L05  010466          1875    1887#
T08L06  010262          1836#   1885
T08L07  010546          1887    1901#
T08L09  010630          1913    1923#
T08L10  010504          1890#   1918    1929    1937
T08L11  010662          1924    1934#
T08L12  010676          1935    1939#
T08L13  010740          1939    1949#
T08L14  010706          1941#   1947    1967    1974
T08L15  011032          1966    1972#
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T08L16  010724          1944#   1973
T09L01  006770          1515    1541#
T09L02  006722          1519    1526#
T09L03  007072          1558    1573#
T09L04  007056          1564#
T09L06  007110          1539    1571    1583#
T11H01  015172          2700    2736#
T11H02  015040          2704#   2734
T11H03  015100          2712    2715#   2719
T11H04  015400          2717    2796#
T11H05  015420          2724    2800#
T11H06  015444          2729    2768    2779    2787    2794    2806#
T11H07  015304          2763    2770#
T11H08  015340          2772    2781#
T11H09  015364          2782    2789#
T11H10  015436          2799    2803#
T11H11  015122          2722#   2726
T11H12  015150          2731#   2732
T11L01  013126          2230    2266#
T11L02  012774          2234#   2264
T11L03  013034          2242    2245#   2249
T11L04  013334          2247    2326#
T11L05  013354          2254    2330#
T11L06  013400          2259    2298    2309    2317    2324    2336#
T11L07  013240          2293    2300#
T11L08  013274          2302    2311#
T11L09  013320          2312    2319#
T11L10  013372          2329    2333#
T11L11  013056          2252#   2256
T11L12  013104          2261#   2262
T12H01  020200          3153    3193#
T12H02  020030          3156#   3191
T12H06  020130          3177    3179#
T12H07  020430          3170    3182    3249#
T12H08  020450          3187    3222    3235    3243    3254#
T12H09  020322          3212    3224#
T12H11  020342          3227    3229#
T12H12  020366          3230    3237#
T12H13  020160          3188#   3190
T12H14  020412          3238    3245#
T12L01  013646          2367    2418#
T12L02  013436          2370#   2405
T12L06  013536          2391    2393#
T12L07  013624          2384    2396    2412#
T12L08  013606          2401    2408#   2416    2447    2460    2468    2473
T12L09  013770          2437    2449#
T12L11  014010          2452    2454#
T12L12  014034          2455    2462#
T12L13  013566          2402#   2404
T12L14  014060          2463    2470#
T13H01  020744          3297    3352#
T13H02  020602          3317#   3350
T13H03  020634          3326#   3331
T13H04  021216          3329    3420#
T13H05  020664          3335#   3341
T13H06  021264          3338    3432#
```

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T13H07  021312          3345    3380    3403    3411    3418    3430    3439#
T13H08  021056          3378    3382#
T13H09  021072          3384    3387#
T13H10  021156          3388    3405#
T13H11  021122          3392    3395#
T13H12  021202          3406    3413#
T13H13  021246          3426#   3437
T13H15  020732          3347    3348#
T13L01  016266          2852    2907#
T13L02  016124          2872#   2905
T13L03  016156          2881#   2896
T13L04  016540          2884    2975#
T13L05  016206          2890#   2896
T13L06  016606          2893    2987#
T13L07  016634          2900    2935    2958    2966    2973    2985    2995#
T13L08  016400          2933    2937#
T13L09  016414          2939    2942#
T13L10  016500          2943    2960#
T13L11  016444          2947    2950#
T13L12  016524          2961    2968#
T13L13  016570          2981#   2992
T13L15  016254          2902    2903#
T14L01  016760          3015    3040#
T14L02  016704          3019#   3071    3112
T14L03  017242          3022    3106#
T14L04  016746          3024    3034#
T14L05  016734          3026    3030#
T14L06  016712          3020#   3028    3032    3038
T14L07  017304          3035    3068    3080    3116#
T14L08  017072          3065    3070#
T14L09  017150          3073    3084#
T14L10  016720          3023#   3082
T14L11  017176          3085    3093#
T14L12  017130          3079#   3091    3104    3114
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T15H02  024466          3664    3678    3761#
T15H03  024510          3667    3767#
T15H04  024560          3687    3725    3738    3746    3759    3765    3780#
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T15H06  024334          3720    3727#
T15H08  024350          3729    3732#
T15H12  024170          3686    3688#   3690
T15H13  024374          3733    3740#
T15H14  024420          3741    3748#
T15H15  024526          3681    3772#
T15H16  024542          3770    3775#
T15H17  024112          3666    3668#
T15H18  024154          3680    3682#
T15H21  024064          3661#   3669
T15H22  024126          3675#   3683
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T15L02  022166          3494    3508    3591#
T15L03  022510          3497    3597#
T15L04  022560          3517    3555    3568    3576    3589    3595    3610#
T15L05  022034          3481#   3521
T15L06  022334          3550    3557#
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T15L13  022374          3563    3570#
T15L14  022420          3571    3578#
T15L15  022526          3511    3602#
T15L16  022542          3600    3605#
T15L17  022112          3496    3498#
T15L18  022154          3510    3512#
T15L21  022064          3491#   3499
T15L22  022126          3505#   3513
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T16L02  025504          3981    3996#
T16L03  025470          3984    3992#
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T16L06  025516          3994    3998#
T16L07  025642          4028    4032#
T16L08  025674          4033    4043#
T16L09  025720          4044    4052#
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T17L02  026104          4101    4114#
T17L03  026174          4103    4131#
T17L04  026136          4106    4122#
T17L05  026152          4108    4126#
T17L06  026422          4110    4120    4137    4165    4174    4183    4194#
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T17L08  026010          4096#   4116
T17L09  026120          4116#   4124
T17L10  026210          4129    4133#
T17L11  026332          4163    4167#
T17L12  026356          4168    4176#
T17L13  026402          4177    4185#
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T18L02  027710          4390    4485#
T18L03  030004          4438    4444    4510#
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T18L13  030170          4548    4556#
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T20L02  031226          4778    4788#
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T20L05  031520          4847    4859#
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T21L02  031704          4935    4939#
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T21L08  032000          4954    4960#
T21L09  031614          4919#   4958    4964    4973    4996    5002
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T21L11  031742          4949#   4994
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T22L02  032754          5064    5106    5111    5128    5136    5139#
T22L03  032526          5089    5094#
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T22L05  032670          5096    5115    5124#
T22L06  032716          5102    5104    5121    5130#
T22L08  032350          5058#   5108    5110
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T22L11  032436          5073#   5124    5130
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T24H09  014504          2591    2596#
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T24H17  014522          2603#   2630
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T24H20  014140          2516#   2521
T24H21  014172          2524#
T24H22  014216          2527    2530#
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T24L02  012154          2043    2060#
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T24L09  012416          2115    2120#
T24L10  012246          2086#   2117    2136    2144
T24L12  012362          2112#   2122
T24L13  012500          2128    2130    2134    2139#
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T24L18  012574          2161#   2176    2183    2189    2196
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T25L02  031064          4723    4734    4737#
T25L03  031030          4724#   4735    4745
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T29L02  027242          4346    4354#
T29L03  027266          4348    4360#
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T30L02  025020          3810    3853#
T30L03  024774          3826    3847#
T30L04  024752          3829    3840#
T30L05  024730          3830#   3845    3851    3857    3885    3896    3905    3913
T30L06  025042          3823    3859#
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UDPAR1= 177662           188#
UDPAR2= 177664           189#
UDPAR3= 177666           190#
UDPAR4= 177670           191#
UDPAR5= 177672           192#
UDPAR6= 177674           193#
UDPAR7= 177676           194#
UDPDR0= 177620           165#
UDPDR1= 177622           166#
UDPDR2= 177624           167#
UDPDR3= 177626           168#
UDPDR4= 177630           169#
UDPDR5= 177632           170#
UDPDR6= 177634           171#
UDPDR7= 177636           172#
UIPAR0= 177640           176#
UIPAR1= 177642           177#
UIPAR2= 177644           178#
UIPAR3= 177646           179#
UIPAR4= 177650           180#
UIPAR5= 177652           181#
UIPAR6= 177654           182#
UIPAR7= 177656           183#
UIPDR0= 177600           154#
UIPDR1= 177602           155#
UIPDR2= 177604           156#
UIPDR3= 177606           157#
UIPDR4= 177610           158#
UIPDR5= 177612           159#
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UIPDR6= 177614           160#
UIPDR7= 177616           161#
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UP1     033260          5207   5218#
UP2     033272          5209   5222#
UP3     033314          5211   5231#
UT4     033352           859   1060   1076   4237   4287   5251#
VEC     034000          4913   5065   5358#
VIP     033434          1459   1646   2977   2989   3422   3434   3998   5070   5273#
WFLI  = 000304           305#
WINIT = 000352           307#  4720   4731
WLOG  = 000222           304#   869   1084   1554   1590   1669   1755   1858   1908   1956   2067   2103   2155
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                        3866   4011   4146   4229   4279   4341   4503   4526   4610   4819   4838   5244   5264
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$ATYC   037056          5955   5957#
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$ATY4   037050          5644   5956#
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$BDADR  001122           412#
$BDDAT  001126           414#
$BELL   035610          5631   5664#
$CDW1   001316           501#
$CDW2   001320           502#
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$CMTAG  001100           400#   574    575    583    589    590    591
$CNTLG  040117          6181#
$CNTLU  040112          6155   6180#
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$DDW0   001322           503#
$DDW1   001324           504#
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$DDW11  001350           514#
$DDW12  001352           515#
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$DDW14  001356           517#
$DDW15  001360           518#
$DDW2   001326           505#
$DDW3   001330           506#
$DDW4   001332           507#
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$DDW9   001344           512#
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$DEVM   001314           500#
$DOAGN  033116          5165   5174   5180#
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$ENVM   001257           470#   612    5896   5901   5964
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                        5480   5526
$EOPCT  033046           589*  5164#  5168
$ERFLG  001103           403#  1718   3079   4742   5557   5580   5582   5588*  5611   5626*  5663
$ERMAX  001115           409#   592*  5582   5605*  5611
$ERROR  035412           583   5625#
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$ERRTY  035614          5638   5672#
$ERTTL  001112           407#  5632*  5663
$ESCAP  035606           591*  5604*  5654   5656   5663#
$ETABL  001256           468#
$ETEND  001362           379    521#
$FATAL  001240           461#  5990*
$FFLG   037276          5953*  5956*  5984   5993*  6001#
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$FILLS  001151           424#  5950
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$GDDAT  001124           413#
$GET42  033076          5173#
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$HIRTS  001000           374#
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$ICNT   001104           404#  5595*  5596   5598*  5610
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$KTNEX  036176          5748   5773#
$KTOUT  036166          5765   5770#
$KT11   036034           906*  1427*  1624*  2850*  3295*  3954*  4321*  4453*  5049*  5746#  5750*  5773*
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$LPERR  001110           406#   594*  1476*  1485*  1650*  1691*  1715*  1777*  1788*  1799*  1805*  1918*  1929*
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$MADR3  001300           493#
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$MAIL   001236           375    379    459*   611   5601   5641   5894
$MAMS1  001266           480#
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$MSGAD  001252          466#  5970*  5973
$MSGLG  001254          467#  5975*
$MSGTY  001236          460#  5968   5976*  5988   5992*
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$MTYP2  001273          489#
$MTYP3  001277          492#
$MTYP4  001303          495#
$MXCNT  035410         5599   5610#
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$OVER   035372         5567   5587   5597   5606#
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$RDCHR  037526         6100#  6277
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$SAVRE= ****** U       6280

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$SIZE   035750          907   1428   1625   2851   3296   3955   4322   4454   5050   5729#
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$SVLAD  035336         5575   5600#
$SVPC = 001014          384#   389
$SWR  = 167000            2#    12     17     18     19     20     21     22     23     24    590    591    593
                        594    897   1104   1143   1208   1234   1267   1325   1368   1422   1513   1619   1831
                       2027   2228   2365   2508   2698   2845   3013   3151   3290   3476   3646   3800   3948
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                       4931*  4934   4937   4977*  4978*  4979*  5069*  5084*  5085*  5088   5091   5142*  5143*
                       5144   5145*  5275   5302   5315*  5317*  5325*  5328*  5331*  5333*  5334*  5335*  5341*
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                        4302    4317#   4318    4320    4352    4364    4387#   4388    4452    4580    4591#   4592    4646
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ENDCOM   139#
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         1806  1847  1870  1879  1897  1919  1930  1968  1975  2175  2181  2188  2194  2297  2308
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         2793  2804  2934  2957  2965  2972  2983  3067  3078  3090  3103  3113  3221  3234  3242
         3247  3252  3379  3402  3410  3417  3428  3554  3567  3575  3588  3594  3608  3724  3737
         3745  3758  3764  3778  3843  3850  3856  3884  3894  3903  3911  4000  4029  4039  4048
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         3721  3734  3742  3877  3880  3900  3907  4022  4025  4045  4052  4157  4160  4169  4178
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MSG11    544#  1401
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MSG14    547#  1813
MSG15    548#  1995  2479
MSG16    549#  2200  2670
MSG17    550#  2340  3126
MSG2     537#  1091
MSG20    551#  2815  3260
MSG21    552#  3000
MSG22    553#  3451  3621
MSG23    554#  3919
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MSG27    558#  4304
MSG3     538#  1131
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SLASH     139#   618    621    656    658    700    702    716    718    758    760    790    792   5188   5190
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         5397   5406   5409   5454   5457   5503   5506   5542   5545
SPACE     139#
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SWP       531#  1530   1541   1564   1573   1639   1656   1725   1742   1978   2161   2266   2632   2736   3830
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TYPTXT    139#
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.HEADE      2#
.KT11       2#    139
.SETUP      2#    337
.SWRHI      2#     13
.SWPLO     25#
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.$APTB    455
.$APTH      2#    358
.$APTY      2#   5950
.$CATC      2#    338
.$CMTA      2#
.$EOP       2#   5149
.$ERRO      2#   5611
.$EPRT      2#   5665
.$POWE      2#   6280
.$RDOC      2#   6186
.$READ      2#   6084
.$SCOP      2#   5552
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.$TYPD      2#   5804
.$TYPE      2#   5871
.$TYPO      2#   6007

. ABS.  056334     000

 ERRORS DETECTED:  0
 DEFAULT GLOBALS GENERATED:  0

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 RUN-TIME: 25 22 7 SECONDS
 RUN-TIME RATIO: 487/51=9.5
 CORE USED:  34K  (68 PAGES)
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