# KD11-Z

11/44 MEM MGMT PRT A

CKKTAA0

AH-F611A-MC

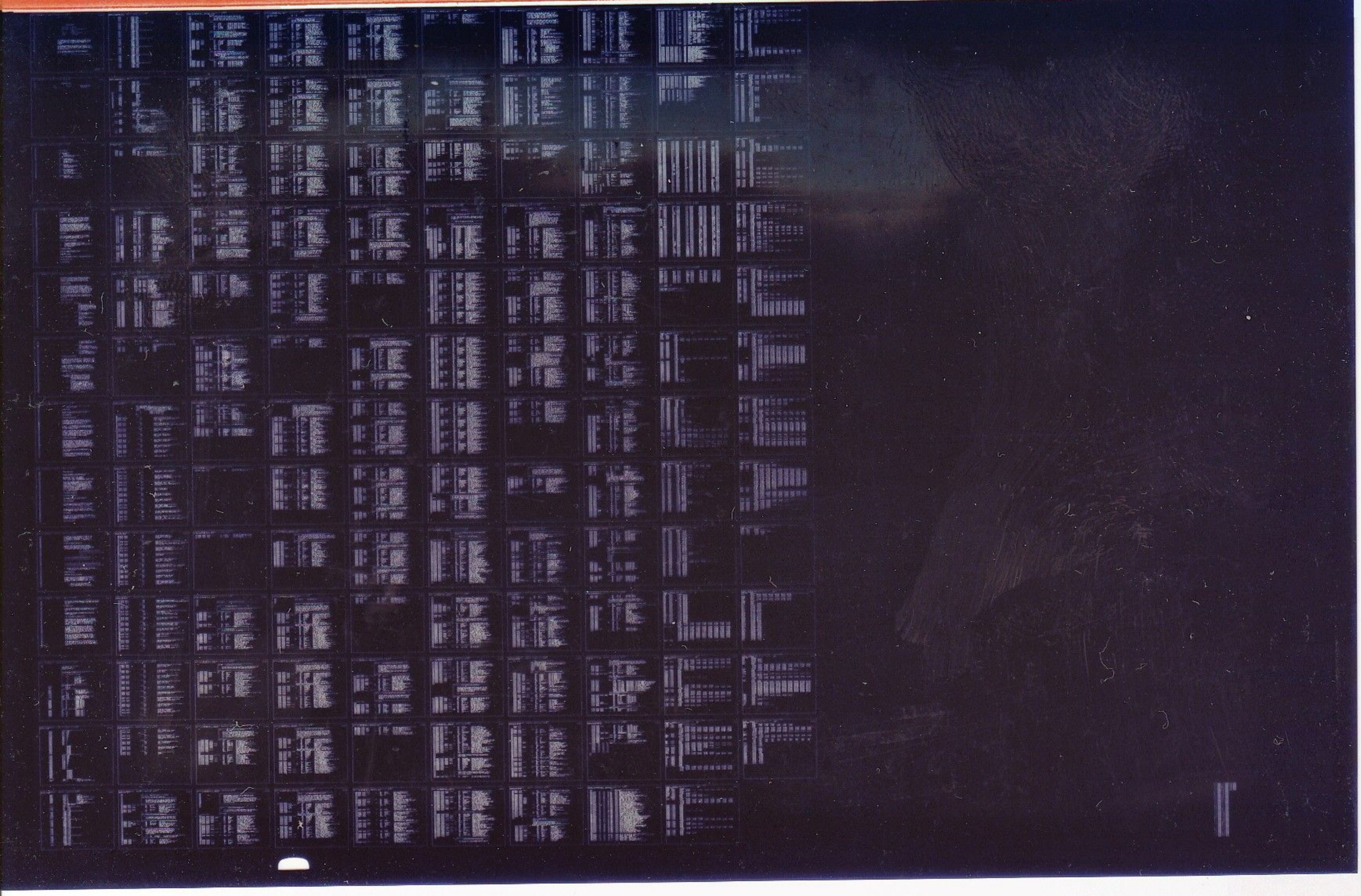


FICHE 1 OF 1

JAN 1980

digital

MADE IN USA



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                .REM    @
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## IDENTIFICATION

PRODUCT CODE: AC-F609A-MC

PRODUCT NAME: CKKTAA0 11/44 MEM MGMT PRT A

DATE: OCTOBER, 1979

MAINTAINER: DIAGNOSTIC ENGINEERING

AUTHOR: J. PETER BRADY

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44
45                                  PROGRAM HISTORY
46                                  ---------------
47
48                          DATE                    REVISION            REASON FOR REVISION
49                          ----                    --------            -------------------
50                          OCTOBER, 1979           A                   FIRST RELEASE
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TABLE OF CONTENTS

## 1.0 PROGRAM INFORMATION

### 1.1 ABSTRACT

THIS PROGRAM WAS DESIGNED USING A ''BOTTOM UP'' APPROACH
STARTING WITH THE SMALLEST SEGMENT OF MEMORY MANAGMENT
LOGIC POSSIBLE AND BUILDING TO COVER ALL OF THE LOGIC.
THE DIAGNOSTIC WILL PROVIDE ENOUGH INFORMATION SUCH THAT
BY DEDUCTION, THE FAILURE CAN BE ISOLATED TO A SMALL
SEGMENT OF THE MEMORY MANAGEMENT LOGIC.

PART A BEGINS BY TESTING SOME OF THE INTERNAL CPU DATA
AND ADDRESS PATHS AND ADDRESS DETECTION LOGIC, THEN
WORKS OUTWARD THROUGH THE MEMORY MANAGEMENT REGISTERS.
AFTER THE REGISTERS ARE FOUND TO BE USEABLE, RELOCATION
(CONSTRUCTION OF PHYSICAL ADDRESSES FROM A VIRTUAL ADDRESS
AND THE ASSOCIATED PAR/PDR INFORMATION) IS TESTED. PART B
BEGINS BY TESTING THE ABORT AND STATUS SEGMENTS OF LOGIC.
PART B THEN CHECKS THE SPECIAL ABORT SEQUENCES, THE MFPI/MTPI
INSTRUCTIONS AND THE CSM INSTRUCTION.

### 1.2 REQUIREMENTS

A PDP 11/44 PROCESSOR WITH A MINIMUM OF 16K OF MEMORY
AND A CONSOLE TERMINAL ARE REQUIRED TO RUN THE PROGRAM
UNLESS THE PROGRAM IS RUNNING UNDER APT OR ACT IN WHICH
CASE THE CONSOLE TERMINAL IS NOT NECESSARY.

### 1.3 RELATED DOCUMENTS AND STANDARDS

1. ACT11/XXDP PROGRAMMING SPECIFICATION
2. STANDARD APT SYSTEM TO A PDP11 DIAGNOSTIC INTERFACE
3. DIAGNOSITC ENGINEERING STANDARDS AND CONVENTIONS
4. PDP11 MAINDEC SYSMAC PACKAGE
5. XXDP USER'S MANUAL

### 1.4 PRELIMINARY PROGRAMS

BEFORE THIS MEMORY MANAGEMENT DIAGNOSITC IS RUN, THE
FOLLOWING DIAGNOSTICS SHOULD BE RUN:

CKKAAA0 1/44 CPU/EIS
CKKABA0 11/44 TRAPS

ALSO, THE MAIN MEMORY DIAGNOSTIC (CZMSD) SHOULD BE RUN TO SCAN
AT LEAST THE FIRST 16K TO SEE THAT A PROGRAM CAN BE EXECUTED.

## 2.0 OPERATING INSTRUCTIONS

### 2.1 LOADING PROCEDURES

THE PROGRAM IS SUPPLIED ON THE DIAGNOSTIC LOAD MEDIA.
REFER TO THE XXDP USER'S MANUAL FOR FURTHER INFORMATION.
FOR USE WITH ACT OR APT, REFER TO THEIR RESPECTIVE
DOCUMENTS.  THE PROGRAM CAN ALSO BE DIRECTLY LOADED
USING THE ABSOLUTE LOADER AND THE BINARY PAPER TAPE.

## 2.2 STARTING PROCEDURES

THE PROGRAM IS STARTED BY LOADING ADDRESS 200 AND
STARTING. THE SWITCH REGISTER SHOULD BE SET ACCORDING TO
SECTION 2.3 BEFORE THE PROGRAM IS STARTED.  HOWEVER, IF
DESIRED, THE PROGRAM WILL USE THE SOFTWARE SWITCH REGISTER
AT LOCATION 176 (LOCATION 174 WILL BE USED AS THE SOFTWARE
DISPLAY REGISTER). IN THAT CASE, THE PROGRAM WILL ASK FOR
THE INITIAL SWITCH REGISTER VALUE BY TYPING ''SWR= XXXXXX
NEW=  '' AFTER TYPING THE NAME OF THE PROGRAM (XXXXXX =
THE OCTAL CONTENTS OF LOCATION 176).  (SEE SECTION 2.4)

ALSO THE PROGRAM CAN BE MADE TO USE THE SOFTWARE SWITCH
REG. EVEN IF THE CONSOLE SWITCH REG. IS PRESENT BY LOADING
''177777'' INTO THE CONSOLE SWITCH REG. BEFORE STARTING
THE PROGRAM.

## 2.3 CONTROL SWITCH SETTINGS

| SWITCH | OCTAL VALUE | USE |
|---|---|---|
| SW15 | 100000 | HALT ON ERROR<br>THIS SWITCH WHEN SET WILL HALT THE PROCESSOR WHEN AN ERROR IS DETECTED AFTER THE ERROR MESSAGE HAS BEEN TYPED. PRESSING CONTINUE WILL RESUME TESTING (SEE SECTION 3.1 ABOUT LOADING THE SWITCH REG BEFORE CONTINUING). |
| SW14 | 040000 | LOOP ON TEST<br>THIS SWITCH WHEN SET WILL CAUSE THE PROGRAM TO LOOP ON THE CURRENT SUBTEST. |
| SW13 | 020000 | INHIBIT ERROR TYPEOUTS<br>THIS SWITCH WHEN SET WILL INHIBIT THE TYPING OF ERROR MESSAGES. |
| SW12 | 010000 | INHIBIT TRACE TRAP<br>THIS SWITCH WHEN SET WILL INHIBIT T-BIT TRAPPING WHICH NORMALLY TAKES PLACE DURING EVERY OTHER PASS STARTING WITH  THE THIRD PASS. |
| SW10 | 002000 | BELL ON ERROR |

```
                                                    THIS SWITCH WHEN SET WILL RING
                                                    THE CONSOLE TERMINAL BELL WHEN
                                                    AN ERROR HAS BEEN DETECTED.

                        SW9     001000          LOOP ON ERROR
                                                    THIS SWITCH WHEN SET WILL
                                                    CAUSE THE PROGRAM TO LOOP ON THE
                                                    FIRST FAILURE WHICH IS ENCOUNTERED
                                                    EVEN IF THE FAILURE IS INTERMITTANT

                        SW8     000400          LOOP ON TEST IN SWR<7:0>
                                                    THIS SWITCH WHEN SET WILL
                                                    CAUSE THE PROGRAM TO LOOP ON THE
                                                    TEST WHOSE TEST NUMBER IS SET
                                                    IN BITS 7-0 OF THE SWITCH REG.

                2.4     LOADING THE SWITCH REGISTER
                        ---------------------------

                        THE CONSOLE SWITCH REGISTER PROVIDED IS LOADED DIRECTLY FROM
                        THE CONSOLE BY TYPING A CONTROL P (^P), THEN WHEN THE CONSOLE
                        PROMPT IS RECIEVED, TYPE 'D SW XXXXXX', WHERE 'XXXXXX' IS THE
                        INTENDED VALUE OF THE SWITCH REGISTER.  THE VALUE OF THE
                        CONSOLE SWITCH REG. CAN BE CHANGED ANY TIME WHETHER THE PROGRAM
                        IS RUNNING OR NOT.

                        TO LOAD THE SOFTWARE SWITCH REG. WHILE THE PROGRAM IS
                        RUNNING, A CONTROL G (^G) SHOULD BE TYPED ON THE CONSOLE
                        TERMINAL. (THE 'SCOPE' AND 'ERROR' ROUTINES CHECK TO SEE
                        IF A ^G HAS BEEN TYPED.)  THE ORIGINAL VALUE OF THE SOFTWARE
                        SWTICH REG. WILL BE REQUESTED AS MENTIONED IN SECTION 2.2.

                        IN RESPONSE TO A ^G OR AT THE BEGINNING OF THE PROGRAM, THE
                        PROGRAM WILL TYPE:

                                SWR = XXXXXX  NEW =

                        WHERE 'XXXXXX' IS THE CURRENT OCTAL CONTENTS OF LOC. 176.
                        THE OPERATOR MAY THEN TYPE ANY ONE OF THE FOLLOWING:
                            XXXXXX<CR>  ONE TO SIX OCTAL DIGITS FOLLOWED BY A
                                        CARRIAGE RETURN WHICH WILL BE LOADED
                                        AS THE NEW VALUE FOR THE SWITCH REG.
                                <CR>    JUST A <CR>, LEAVES THE SWITCH REG.
                                        AS IT IS.
                                XXX^U   A CONTROL-U (^U) WILL CAUSE ALL OF THE
                                        DIGITS TYPED SO FAR TO BE IGNORED.
                                ^C      WILL CAUSE THE PROGRAM TO TYPE THE PRESENT
                                        TEST AND PASS NUMBERS, REQUEST A NEW VALUE
                                        FOR THE SWITCH REG., AND JUMP TO THE END-
                                        OF-PASS ROUTINE SO THE PROGRAM WILL GO DIRECTLY
                                        TO THE NEXT PASS WITH A NEW SW. REG. VALUE
                            <ILL.CHAR>  ANY CHARACTER TYPED WHICH IS NOT ANY OF THE
                                        ABOVE OR AN OCTAL DIGIT WILL CAUSE THE PROGRAM
                                        TO TYPE A '?<CRLF>' AND REACT AS THOUGH A
                                        ^U HAD BEEN TYPED.

                        NOTE:   RECOGNITION OF A ^G MAY BE HAMPERED BY
```

264 ----- EXECUTION OF A COUPLE 'RESET' INSTRUCTIONS
265 WITHIN THE PROGRAM.
266
267 2.5 EXECUTION TIMES
268 ---
269
270 THE RUN TIME FOR A SINGLE PASS WITH TRACE TRAPPING
271 ENABLED IS APPROXIMATELY 8 SECONDS WITH CACHE.
272
273 3.0 ERROR INFORMATION
274 ---
275
276 3.1 ERROR REPORTING PROCEDURES
277 ---
278
279 IF AN ERROR IS DETECTED, THE PROGRAM WILL TRAP TO THE
280 ERROR HANDLING ROUTINE ($ERROR). THE VALUE OF BITS
281 15,13,10, AND 9 IN THE SWITCH REGISTER ARE CONSIDERED
282 IN REPORTING AN ERROR (SEE SECTION 2.3). THE
283 ERROR INFORMATION WILL BE TYPED UNLESS SW13 = 1.
284
285 IF SW15 = 1, THE PROCESSOR WILL HALT AFTER THE ERROR IS
286 REPORTED. IF THE CONTENTS OF THE SOFTWARE SWITCH REGISTER
287 ARE TO BE CHANGED, A ^G SHOULD BE TYPED BEFORE PRESSING
288 ''CONTINUE'' TO RESUME TESTING.
289
290 IF SW9 = 1 (LOOP ON ERROR), THE PROGRAM WILL GO TO THE
291 ADDRESS CONTAINED IN LOCATION ''$LPERR''. AFTER REPORTING
292 THE ERROR. ''$LPERR'' IS SET BY EACH ''SCOPE'' CALL AND IS
293 SET DIRECTLY DURING SOME SUBTESTS TO PROVIDE THE SMALLEST
294 LOOP FOR LOOPING ON ERROR. IF SW9 = 0, THE PROGRAM WILL
295 RETURN TO THE INSTRUCTION FOLLOWING THE ERROR CALL.
296 (SEE SECTION 5.3 FOR MORE ON 'LOOP ON ERROR').
297
298 3.2 INTERPRETING ERROR REPORTS
299 ---
300
301 EVERY ERROR REPORT TYPES THE NUMBER OF THE TEST IN WHICH
302 THE ERROR TOOK PLACE (TESTNO) AND THE LOCATION OF THE
303 ERROR CALL (ERRORPC). THESE TWO VALUES PINPOINT THE
304 PLACE IN THE CODE THAT THE ERROR OCCURRED. BY REFERRING
305 TO THE PROGRAM LISTING, THE OPERATOR CAN THEN READ THE
306 COMMENTS ASSOCIATED WITH THAT PARTICULAR ERROR AND SUBTEST.
307 A DESCRIPTION OF THE TEST FOUND IN THE PROGRAM LISTING
308 WILL ALSO PROVIDE THE OPERATOR WITH INFORMATION ON THE LOGIC
309 AND FUNCTIONS BEING TESTED.
310
311 EVERY ERROR REPORT ALSO TYPES AN ERROR MESSAGE
312 GIVING A VERBAL DESCRIPTION OF THE ERROR THAT HAS
313 BEEN DETECTED.
314
315 BY USING THE COMMENTS AND TEST DESCRIPTION FOUND IN
316 THE PROGRAM LISTING TO DETERMINE WHAT FUNCTION OR
317 LOGIC WAS BEING TESTED, THE OPERATOR CAN THEN REFER
318 TO THE ENGINEERING DRAWINGS TO ISOLATE THE PROBABLE
319 CAUSE FOR THE FAILURE.
320

## 3.3 SAMPLE ERROR REPORT

BELOW IS AN EXAMPLE OF AN ERROR WHICH COULD HAVE
OCCURRED DURING EXECUTION OF THE PROGRAM:

```
MEM. MGMT. REG. BITS NOT SET CORRECTLY
REGISTR WROTE   READ    READ-(BINARY)
ADDRESS (OCTAL) (OCTAL) 5432109876543210  TESTNO  ERRORPC
177572  040000  060000  0110000000000000  000012  022060
```

WE SEE THAT THE ERROR OCCURRED IN TEST 12 AT LOCATION
022060.  THE "REGISTER ADDRESS" TELLS US THAT WE WERE
TESTING MEMORY MANAGEMENT'S STATUS RGISTER 0 (SR0).
IN THE LISTING, THE TEST DESCRIPTION SAYS THAT THE
ERROR BITS (BITS <15:13>) OF SR0 WERE BEING SET AND
CLEARED INDIVIDUALLY.  THE ERROR REPORT SAYS WE TRIED
TO SET BIT 14 BY WRITING "040000" TO SR0 BUT WHEN WE
READ IT BACK WE READ "060000".  IT APPEARS THAT BIT 13 IS
STUCK AT "1" OR IT IS GETTING SET WHEN BIT 14 IS SET
TO "1".  ERROR REPORTS BEFORE AND AFTER THIS ONE COULD
TELL US WHICH IS THE CASE.

# 4.0 MISCELLANEOUS INFORMATION

## 4.1 ACT/APT/XXDP COMPATABILITY

THE PROGRAM IS FULLY ACT AND APT COMPATABLE
AND IS SUPPORTED UNDER THE XXDP PACKAGE.

## 4.2 END-OF-PASS MESSAGE

AT THE END OF EACH PASS OF THE PROGRAM THE PASS NUMBER
AND TOTAL NUMBER OF ERRORS SINCE THE LAST END-OF-PASS ARE
REPORTED IN THE END-OF-PASS MESSAGE.  FOR EXAMPLE:

```
        END OF PASS #2  TOTAL ERRORS SINCE LAST REPORT 0
```

THAT WOULD INDICATE THAT PASS TWO WAS JUST COMPLETED
AND NO ERRORS WERE  DETECTED DURING THAT PASS.  BOTH
THE PASS NUMBER AND NUMBER OF ERRORS ARE DECIMAL  NUMBERS.

## 4.3 T-BIT TRAPPING

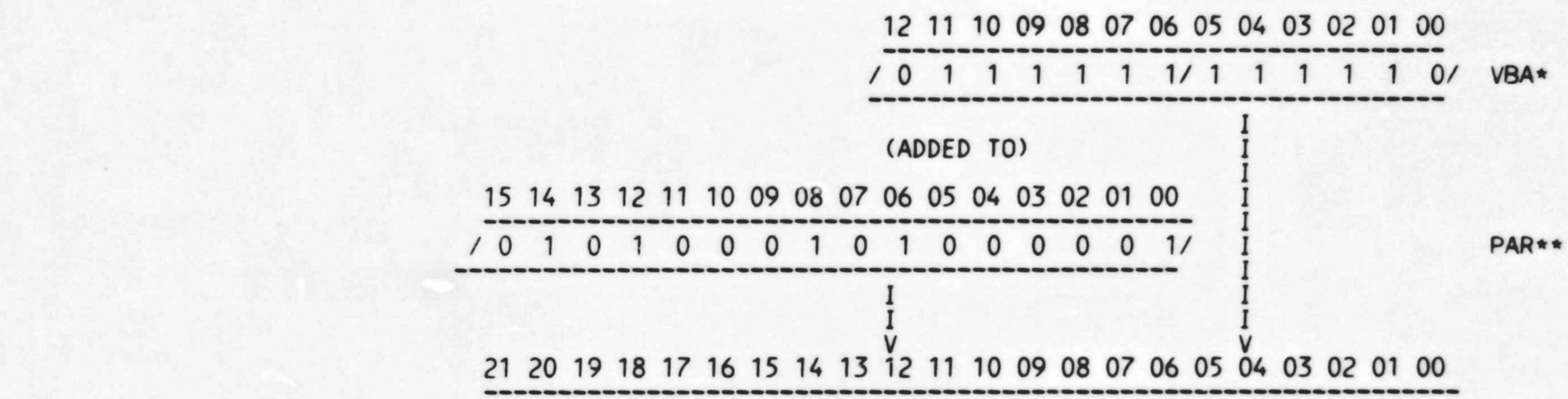
THE "T-BIT" (BIT 4) IN THE PROCESSOR  STATUS WORD IS SET
BY AN "RTI" IN THE END-OF-PASS ROUTINE FOR EVERY OTHER PASS
BEGINNING WITH THE THIRD PASS (PASSES 3,5,7,9...).  T-BIT
TRAPPING CAN BE INHIBITED BY SETTING BIT 12 = 1 IN THE SWITCH
REGISTER  (SEE SECTION 2.4).

## 4.4 POWER FAILURE HANDLING

IF A POWER FAIL OCCURS (FOLLOWED BY A POWER UP), THE MESSAGE "POWER FAILURE-RESTARTING" IS TYPED OUT AND THE PROGRAM WILL RESTART EXECUTION AT "START:" (THE VERY BEGINNING OF THE PROGRAM. IF THE SOFTWARE SWITCH REGISTER IS BEING USED, ITS CONTENTS WILL BE RESTORED.

## 4.5 PHYSICAL BUS ADDRESS CONSTRUCTION

BELOW IS A SIMPLIFIED DIAGRAM OF HOW THE MEMORY MANAGEMENT LOGIC CONSTRUCTS A PHYSICAL BUS ADDRESS USING THE VIRTUAL ADDRESS AND THE PAGE ADDRESS REGISTER. THE PAGE DESCRIPTOR REGISTER SELECTED WILL CONTAIN THE PAGE EXPANSION, LENGTH, AND ACCESS INFORMATION.




*= VBA BITS <15:13> SELECT THE APPROPRIATE PAR AND PDR
**= PSW MODE BITS <15:14> SELECTS THE USER (=11), SUPERVISOR (=01) OR KERNEL (=00) SET OF PAR'S/PDR'S

# 5.0 PROGRAM DESCRIPTION

## 5.1 SUBROUTINES USED BY THIS PROGRAM

FOLLOWING IS A LIST OF THE SUBROUTINES AND HANDLERS USED BY THIS PROGRAM THAT ARE NOT PROVIDED BY THE "SYSMAC PACKAGE". DETAILS OF THE SUBROUTINES UNIQUE TO THIS PROGRAM MAY BE FOUND IN THE PROGRAM LISTING. REFER TO THE "SYSMAC" DOCUMENT AND PROGRAM LISTING FOR THE OTHER ROUTINES.

1. TURN OFF T-BIT AND SAVE CURRENT PSW
2. TURN ON T-BIT AND RESTORE PREVIOUS PSW
3. SET ALL WRITEABLE BITS IN ALL PAR/PDR'S
4. CONVERT VIRTUAL ADDRESS TO PHYSICAL ADDRESS

NOTE ALSO THAT THE MACRO LIBRARY USED TO ASSEMBLE THIS PROGRAM
HAS OTHER SPECIAL ROUTINES APPENDED TO THE SYSMAC MACRO PACKAGE;
THIS LIBRARY MUST BE USED TO ASSEMBLE EITHER PART A OR PART B
CORRECTLY.

## 5.2 PROGRAM LISTING

A TABLE OF CONTENTS APPEARS AT THE BEGINNING OF THE LISTING
WHICH CONTAINS THE NAMES OF EACH SECTION, SUBTEST, AND
ROUTINE AND THE LINE NUMBERS CORRESPONDING TO THE START OF
EACH.

FOLLOWING THIS SECTION OF DOCUMENTATION IS THE ACTUAL
PROGRAM LISTING COMPLETE WITH SUBTEST DESCRIPTIONS AND
''CODING COMMENTS''.

## 5.3 USING THE PROGRAM TO DIAGNOSE A FAULT

WHEN AN ERROR OCCURS, ONE OF THE THINGS THAT'S IMPORTANT
TO NOTE IS WHAT PASS THE ERROR OCCURRED ON.  IF THE PASS
NUMBER IS ODD AND IS THREE OR GREATER, THE ERROR MIGHT BE
T-BIT SENSITIVE.  TRY RUNNING THE PROGRAM AGAIN WITH  BIT
12 OF THE SWITCH REG. EQUAL TO ''1'' TO INHIBIT T-BIT
TRAPPING.  THIS SHOULD HELP YOU DETERMINE WHAT MAKES THE
MACHINE FAIL AND WHEN.

IF YOU HAVE BEEN RUNNING WITH BIT 15 OF THE SWITCH
REG. EQUAL TO ''0'', THEN YOU ARE ABLE TO LOOK AT ALL
THE ERRORS THAT MAY BE RELATED TO THE FAULT YOU ARE
DIAGNOSING.  A FAULT IN AN EARLIER TEST MAY RESULT IN
ERRORS DURING LATER TESTS WHICH MAY GIVE YOU MORE
CLUES ABOUT THE NATURE OF THE FAULT.  NOW USE THE METHOD
OUTLINED IN SECTION 3.2 FOR EACH ERROR TO GATHER AS
MUCH INFORMATION AS POSSIBLE.

NOW TO TEST YOUR IDEAS ON THE CAUSE OF THE FAILURE,
YOU MAY WANT TO SCOPE THIS ERROR CONDITION.  SET BIT 09
OF THE SWITCH REG. EQUAL TO ''1'' TO LOOP ON THE ERROR.
FOR AN EVEN TIGHTER SCOPE LOOP THE ERROR CALL CAN BE
REPLACED WITH A BRANCH (REFER TO COMMENTS BY ERROR CALLS
IN THE PROGRAM LISTING).

OR YOU COULD LOOP ON THE TEST BY EITHER SETTING BIT 14
OF THE SWITCH REG. EQUAL TO ''1'' OF BY SETTING BIT 08 OF THE
SWITCH REG. EQUAL TO ''1'' AND THEN SETTING THE TEST NUMBER
IN BITS 07-00 OF THE SWITCH REG.  YOU WILL PROBABLY WANT TO
INHIBIT ERROR TYPEOUTS BY SETTING BIT 13 OF THE SWITCH REG.
EQUAL TO ''1''.

```
804
805                             .TITLE  CKKTAA0 11/44 MEM MGMT PRT A
                                ;*COPYRIGHT (C) 1979
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*
806                             .SBTTL  OPERATIONAL SWITCH SETTINGS
                                ;*
                                ;*      SWITCH                  USE
                                ;*      ------          --------------------
                                ;*        15            HALT ON ERROR
                                ;*        14            LOOP ON TEST
                                ;*        13            INHIBIT ERROR TYPEOUTS
                                ;*        12            INHIBIT TRACE TRAP
                                ;*        10            BELL ON ERROR
                                ;*         9            LOOP ON ERROR
                                ;*         8            LOOP ON TEST IN SWR<7:0>
807                             .SBTTL  BASIC DEFINITIONS
                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
001100                          STACK=  1100
104000                                  ERROR=EMT
000004                                  SCOPE=IOT
                                ;*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
177776                                  PSW=PS
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
001000                          SW9=SW09
000400                          SW8=SW08
000200                          SW7=SW07
000100                          SW6=SW06
000040                          SW5=SW05
000020                          SW4=SW04
000010                          SW3=SW03
000004                          SW2=SW02
000002                          SW1=SW01
000001                          SW0=SW00
                        ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT09=  1000
000400                  BIT08=  400
000200                  BIT07=  200
000100                  BIT06=  100
000040                  BIT05=  40
000020                  BIT04=  20
000010                  BIT03=  10
000004                  BIT02=  4
000002                  BIT01=  2
000001                  BIT00=  1
001000                          BIT9=BIT09
000400                          BIT8=BIT08
000200                          BIT7=BIT07
000100                          BIT6=BIT06
000040                          BIT5=BIT05
000020                          BIT4=BIT04
000010                          BIT3=BIT03
000004                          BIT2=BIT02
000002                          BIT1=BIT01
000001                          BIT0=BIT00
                        ;*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
    808                                 .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
```

```
                        SIPDR2= 172204
                        SIPDR3= 172206
                        SIPDR4= 172210
                        SIPDR5= 172212
                        SIPDR6= 172214
                        SIPDR7= 172216
                        ;*SUPERVISOR 'D' PAGE DESCRIPTOR REGISTERS
                        SDPDR0= 172220
                        SDPDR1= 172222
                        SDPDR2= 172224
                        SDPDR3= 172226
                        SDPDR4= 172230
                        SDPDR5= 172232
                        SDPDR6= 172234
                        SDPDR7= 172236
                        ;*SUPERVISOR 'I' PAGE ADDRESS REGISTERS
                        SIPAR0= 172240
                        SIPAR1= 172242
                        SIPAR2= 172244
                        SIPAR3= 172246
                        SIPAR4= 172250
                        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
```

```
                172352                  KIPAR5= 172352
                172354                  KIPAR6= 172354
                172356                  KIPAR7= 172356
                                        ;*KERNEL 'D' PAGE ADDRESS REGISTERS
                172360                  KDPAR0= 172360
                172362                  KDPAR1= 172362
                172364                  KDPAR2= 172364
                172366                  KDPAR3= 172366
                172370                  KDPAR4= 172370
                172372                  KDPAR5= 172372
                172374                  KDPAR6= 172374
                172376                  KDPAR7= 172376
    809                                 ;*ADDITIONAL DEFINITIONS
    810                                 ;*
    811         177572                          MMR0=SR0
    812         177574                          MMR1=SR1
    813         177576                          MMR2=SR2
    814         172516                          MMR3=SR3
    815         000006                          KSP=SP
    816         000006                          SSP=SP
    817         000006                          USP=SP
    818         000020                          TBIT=BIT4
    819         000100                          WBIT=BIT6
    820         001100                  KERSTK=STACK
    821         000700                  SUPSTK=STACK-200
    822         000600                  USESTK=STACK-300
    823         177766                  CPUERR=177766
    824         177770                  RMIREG=177770
    879
    881                                 .SBTTL  TRAP CATCHER
                000000                          .=0
                                        ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
                                        ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
                                        ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
                000174                          .=174
    000174  000000                     DISPREG: .WORD  0                   ;;SOFTWARE DISPLAY REGISTER
    000176  000000                     SWREG:   .WORD  0                   ;;SOFTWARE SWITCH REGISTER
                                        .SBTTL  STARTING ADDRESS(ES)
    000200  000137  020000                      JMP     @#START ;;JUMP TO STARTING ADDRESS OF PROGRAM
    882                                 .SBTTL  ACT11 HOOKS
                                        ;;******************************************************************
                                        ;HOOKS REQUIRED BY ACT11
                000204                          $SVPC=.                     ;SAVE PC
                000046                          .=46
    000046  035116                              $ENDAD                      ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                000052                          .=52
    000052  000000                              .WORD   0                   ;;2)SET LOC.52 TO ZERO
                000204                          .=$SVPC                     ;; RESTORE PC
    883                                 .SBTTL  APT PARAMETER BLOCK
                                        ;;******************************************************************
                                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                        ;;******************************************************************
                000204                          .$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  000204                              $APTHDR ;;POINT TO APT HEADER BLOCK
```

```
                000204                          .=.$X   ;;RESET LOCATION COUNTER
                                        ;;**************************************************************
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.
        000204                          $APTHD:
        000204  000000                  $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
        000206  001224                  $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
        000210  000010                  $TSTM:  .WORD   10      ;;RUN TIM OF LONGEST TEST
        000212  000020                  $PASTM: .WORD   20      ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
        000214  000005                  $UNITM: .WORD   5       ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
        000216  000014                          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                                .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 ADDRESS
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 ADDRESS OF 'GOOD' DATA
001122  000000         $BDADR:  .WORD   0               ;;CONTAINS ADDRESS 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  000            $AUTOB:  .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135  000            $INTAG:  .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570         SWR:     .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570         DISPLAY: .WORD   DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560         $TKS:    177560                  ;;TTY KBD STATUS
001146  177562         $TKB:    177562                  ;;TTY KBD BUFFER
001150  177564         $TPS:    177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566         $TPB:    177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154  000            $NULL:   .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155  002            $FILLS:  .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156  012            $FILLC:  .BYTE   12              ;;INSERT FILL CHARS. AFTER A 'LINE FEED''
001157  000            $TPFLG:  .BYTE   0               ;;'TERMINAL AVAILABLE'' FLAG (BIT<07>=0=YES)
001160  000000         $REGAD:  .WORD   0               ;;CONTAINS THE ADDRESS FROM
                                                        ;;WHICH  ($REG0) WAS OBTAINED
                        000006          .REPT   $CM3
001162  000000         $REG0:   .WORD   0               ;;CONTAINS (($REGAD)+0)
001164  000000         $REG1:   .WORD   0               ;;CONTAINS (($REGAD)+2)
001166  000000         $REG2:   .WORD   0               ;;CONTAINS (($REGAD)+4)
001170  000000         $REG3:   .WORD   0               ;;CONTAINS (($REGAD)+6)
001172  000000         $REG4:   .WORD   0               ;;CONTAINS (($REGAD)+10)
001174  000000         $REG5:   .WORD   0               ;;CONTAINS (($REGAD)+12)
                        000006  .REPT   6
001176  000000         $TMP0:   .WORD   0               ;;USER DEFINED
001200  000000         $TMP1:   .WORD   0               ;;USER DEFINED
001202  000000         $TMP2:   .WORD   0               ;;USER DEFINED
001204  000000         $TMP3:   .WORD   0               ;;USER DEFINED
001206  000000         $TMP4:   .WORD   0               ;;USER DEFINED
001210  000000         $TMP5:   .WORD   0               ;;USER DEFINED
001212  000000         $ESCAPE:0                        ;;ESCAPE ON ERROR ADDRESS
001214  207      377 377 $BELL:   .ASCIZ  <207><377><377> ;;CODE FOR BELL
001217  000
001220  077            $QUES:   .ASCII  /?/             ;;QUESTION MARK
001221  015            $CRLF:   .ASCII  <15>            ;;CARRIAGE RETURN
001222  012      000   $LF:     .ASCIZ  <12>            ;;LINE FEED
```

```
                        ;;*****************************************************************
                        .SBTTL  APT MAILBOX-ETABLE
                        ;;*****************************************************************
                        .EVEN
001224                  $MAIL:                          ;;APT MAILBOX
001224  000000         $MSGTY: .WORD   AMSGTY  ;;MESSAGE TYPE CODE
001226  000000         $FATAL: .WORD   AFATAL  ;;FATAL ERROR NUMBER
001230  000000         $TESTN: .WORD   ATESTN  ;;TEST NUMBER
001232  000000         $PASS:  .WORD   APASS   ;;PASS COUNT
001234  000000         $DEVCT: .WORD   ADEVCT  ;;DEVICE COUNT
001236  000000         $UNIT:  .WORD   AUNIT   ;;I/O UNIT NUMBER
001240  000000         $MSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001242  000000         $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001244                  $ETABLE:                        ;;APT ENVIRONMENT TABLE
001244      000         $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
001245      000         $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
001246  000000         $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
001250  000000         $USWR:  .WORD   AUSWR   ;;USER SWITCHES
001252  000000         $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
                        ;*                              BITS 15-11=CPU TYPE
                        ;*                                      11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
                        ;*                                      11/70=06,PDQ=07,Q=10
                        ;*                              BIT 10=REAL TIME CLOCK
                        ;*                              BIT  9=FLOATING POINT PROCESSOR
                        ;*                              BIT  8=MEMORY MANAGEMENT
001254                  $ETEND:
                        .MEXIT

001254  000000         TESTNO: .WORD   0               ;HOLDS TEST NUMBER FOR TYPEOUTS
001256  000000         WASR6:  .WORD   0               ;USED TO STORE THE STACK POINTER AFTER A TRAP
001260  000000         TRAPPC: .WORD   0               ;USED TO STORE THE PC OF A TRAP OR ABORT
001262  000000         TRAPPS: .WORD   0               ;USED TO STORE THE PS OF A TRAP OR ABORT
001264  000000         WASSR0: .WORD   0               ;USED TO STORE CONTENTS OF SR0
001266  000000         WASSR1: .WORD   0               ;USED TO STORE CONTENTS OF SR1
001270  000000         WASSR2: .WORD   0               ;USED TO STORE CONTENTS OF SR2
001272  000000         TBITPS: .WORD   0               ;SAVES THE PSW THAT MAY HAVE ITS T-BIT ON
001274  000000         TONUM:  .WORD   0               ;HOLDS NUMBER OF TIME-OUTS
001276  000000         VIRT1:  .WORD   0               ;HOLDS VIRTUAL ADDRESS TO BE CONVERTED
001300  000000         VIRT2:  .WORD   0               ;       "       "       "
001302  000000         PBALO:  .WORD   0               ;HOLDS BITS <15:00> OF PHYSICAL ADDRESS
001304  000000         PBAHI:  .WORD   0               ;HOLDS BITS <21:16> OF PHYSICAL ADDRESS
001306  000000         DATAOR: .WORD   0               ;HOLDS LOGICAL OR OF BAD DATA
001310  000000         DATAND: .WORD   0               ;HOLDS LOGICAL AND OF BAD DATA
001312  000000         PATTOR: .WORD   0               ;HOLDS LOGICAL OR OF PATTERN LOADED
001314  000000         PATAND: .WORD   0               ;HOLDS LOGICAL AND OF PATTERN LOADED
001316  000000         ADDROR: .WORD   0               ;HOLDS LOGICAL OR OF ADDRESS
001320  000000         ADRAND: .WORD   0               ;HOLDS LOGICAL AND OF ADDRESS
001322  000000         ERRCNT: .WORD   0               ;HOLDS NUMBER OF ERRORS ON TEST
001324  000000         BADPC:  .WORD   0               ;HOLDS PC FROM ABORT OR TRAP
001326  000000         OLDPC:  .WORD   0               ;HOLDS RETURN ADDRESS IN CASE OF LOOP ON ERROR
001330  000000         OLDPS:  .WORD   0               ;HOLDS OLD PSW IN CASE OF LOOP ON ERROR
001332  000000         PCPUER: .WORD   0               ;HOLDS VALUE OF CPU ERROR REGISTER
001334  000000         CPUEXP: .WORD   0               ;HOLDS EXPECTED CPU ERROR CONDITION
001336  000000         HOLFLG: .WORD   0               ;HOLDS NUMBER OF TIMEOUTS FOR CARRY PROPAGATION TEST
001340  000000         HDWFLAG:.WORD   0               ;FLAGS APT SPECIAL HARDWARE FOR T47 & T50
001342  020000         READON: .WORD   20000           ;READ ONLY BIT IN MMR0
001344  000200         $MXCNT: .WORD   200             ;HOLD MAX. NUMBER OF LOOP ITERATIONS
```

```
001346  000000                  $TBIT:  .WORD   0               ;'T' BIT STATE INDICATOR
001350     136     103     015  $CNTLC: .ASCIZ  /^C/<15><12>    ;CONTROL C
001353     012     000
                                .EVEN
001356                          PARTAB:                         ;THIS IS THE TABLE OF THE FIRST PAR OR PDR
                                                                ;OF EACH GROUP. THEY ARE USED FOR THE DUAL
                                                                ;ADDRESSING TEST.
001356  172200                          .WORD   172200          ;SIPDR0
001360  172240                          .WORD   172240          ;SIPAR0
001362  172300                          .WORD   172300          ;KIPDR0
001364  172340                          .WORD   172340          ;KIPAR0
001366  177600                          .WORD   177600          ;UIPDR0
001370  177640                          .WORD   177640          ;UIPAR0
```

```
                                .SBTTL  ERROR POINTER TABLE
                                ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
                                ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
                                ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
                                ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
                                ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
                                ;*      EM              ;;POINTS TO THE ERROR MESSAGE
                                ;*      DH              ;;POINTS TO THE DATA HEADER
                                ;*      DT              ;;POINTS TO THE DATA
                                ;*      DF              ;;POINTS TO THE DATA FORMAT
    001372                      $ERRTB:
885
886                             ;*ITEM 1
887 001372  041304                      EM1             ;UNEXPECTED CPU TRAP TO LOC. 004
888 001374  044647                      DH1             ;OLD PC  OLD PSW R6 WAS  CPUERR  TESTNO  ERRORPC
889 001376  047606                      DT1             ;TRAPPC,TRAPPS,WASR6,CPUERR,TESTNO,$ERPPC, 0
890 001400  050360                      DF1             ;0,0,0,0,0
891
892                             ;*ITEM 2
893 001402  041344                      EM2             ;UNEXPECTED MEM. MGMT. TRAP TO LOC. 250
894 001404  044727                      DH2             ;OLD PC  OLD PSW R6 WAS  SR0     SR1     SR2     TESTNO  ERR
895 001406  047624                      DT2             ;TRAPPC,TRAPPS,WASR6,WASSR0,WASSR1,WASSR2,TESTNO,$ERRPC,0
896 001410  050365                      DF2             ;0,0,0,0,0,0,0,0
897
898                             ;*ITEM 3
899 001412  041413                      EM3             ;PRIORITY BITS SET WRONG IN PSW
900 001414  045026                      DH3             ;WROTE   READ    TESTNO  ERRORPC
901 001416  047646                      DT3             ;$REG0,$REG1,TESTNO,$ERRPC,0
902 001420  050375                      DF3             ;0,0,0,0
903
904                             ;*ITEM 4
905 001422  041452                      EM4             ;MODE BITS SET WRONG IN PSW
906 001424  045026                      DH3             ;WROTE   READ    TESTNO  ERRORPC
907 001426  047646                      DT3             ;$REG0,$REG1,TESTNO,$ERRPC,0
908 001430  050375                      DF3             ;0,0,0,0
909
910                             ;*ITEM 5
911 001432  041505                      EM5             ;DUAL ADDRESSING BETWEEN HI&LO BYTES OF PSW
912 001434  045026                      DH3             ;WROTE   READ    TESTNO  ERRORPC
913 001436  047646                      DT3             ;$REG0,$REG1,TESTNO,$ERRPC,0
914 001440  050375                      DF3             ;0,0,0,0
915
916                             ;*ITEM 6
917 001442  041560                      EM6             ;KERNEL R6 CHANGED BY WRITING SUPERVISOR/USER R6
918 001444  045026                      DH3             ;WROTE   READ    TESTNO  ERRORPC
919 001446  047646                      DT3             ;$REG0,$REG1,TESTNO,$ERRPC,0
920 001450  050375                      DF3             ;0,0,0,0
921
922                             ;*ITEM 7
923 001452  041643                      EM7             ;A MEMORY MGMT. REG. TIMED OUT
924 001454  045066                      DH7             ;ADDRESS TESTNO  ERRORPC
925 001456  047660                      DT7             ;$REG0,TESTNO,$ERRPC,0
926 001460  050401                      DF7             ;0,0,0
927
928                             ;*ITEM 10
929 001462  041701                      EM10            ;SUMMARY OF MEM. MGMT. REG. TIMEOUTS
930 001464  045116                      DH10            ;REGISTER-ADDRS  NUM. OF
```

```
                                                ;AND-ED  OR-ED   TIMOUTS TESTNO ERRORPC
001466  047670                    DT10        ;ADRAND,ADDROR,TONUM,TESTNO,$ERRPC,0
001470  050404                    DF10        ;0,0,1,0,0

                        ;*ITEM 11
001472  041745                    EM11        ;MEM. MGMT. REG. WOULD NOT CLEAR
001474  045216                    DH11        ;REGISTR READ    READ-(BINARY)
                                              ;ADDRESS (OCTAL) 5432109876543210  TESTNO  ERRORPC
001476  047704                    DT11        ;$REG0,$REG1,$REG1,TESTNO,$ERRPC,0
001500  050411                    DF11        ;0,0,2,0,0

                        ;*ITEM 12
001502  042005                    EM12        ;MEM. MGMT. REG. BITS NOT SET CORRECTLY
001504  045336                    DH12        ;REGISTR WROTE   READ    READ
                                              ;ADDRESS (OCTAL) (OCTAL) (BINARY) TESTNO ERRORPC
001506  047720                    DT12        ;$REG0,$REG1,$REG2,$REG2,TESTNO,$ERRPC,0
001510  050416                    DF12        ;0,0,0,2,0,0

                        ;*ITEM 13
001512  042054                    EM13        ;SR0 EFFECTED BY WRITE TO PSW
001514  045476                    DH13        ;READ    TESTNO  ERRORPC
001516  047660                    DT7         ;$REG0,TESTNO,$ERRPC,0
001520  050401                    DF7         ;0,0,0

                        ;*ITEM 14
001522  042111                    EM14        ;MMR1 DID NOT TRACK PROPERLY
001524  045526                    DH14        ;EXPECTD (MMR1)  TESTNO  ERRORPC
001526  047736                    DT14        ;$REG3,$REG1,TESTNO,$ERRPC,0
001530  050375                    DF3         ;0,0,0,0

                        ;*ITEM 15
001532  042145                    EM15        ;MMR3 IS HOLDING THE WRONG DATA
001534  045566                    DH15        ;LOADED  (MMR3)  TESTNO  ERRORPC
001536  047750                    DT15        ;$REG2,$REG1,TESTNO,$ERRPC,0
001540  050375                    DF3         ;0,0,0,0

                        ;*ITEM 16
001542  042204                    EM16        ;DUAL ADDRESSING BETWEEN PAR-PDR GROUPS
001544  045626                    DH16        ;INDEX   INDEX   PAR-PDR
                                              ;EXPECTD RECEIVD ADDRREAD TESTNO ERRORPC
001546  047762                    DT16        ;$REG0,$REG1,$REG2,TESTNO,$ERRPC,0
001550  050360                    DF1         ;0,0,0,0,0

                        ;*ITEM 17
001552  042253                    EM17        ;PHYS. ADDR. FORMED READ WRONG IN MAINT. MODE
001554  045727                    DH17        ;VIR ADDR  KIPAR4 GDDATA  BADDATA TESTNO  ERRORPC
001556  047776                    DT17        ;$REG0,KIPAR4,$REG1,$REG2,TESTNO,$ERRPC,0
001560  050365                    DF2         ;0,0,0,0,0,0

                        ;*ITEM 20
001562  042331                    EM20        ;PHYS. ADDR. FORMED READ WRONG IN RELOCATE MODE
001564  046010                    DH20        ;PHYSICL PAR 4   PAR 5
                                              ;ADDRESS VBA     VBA     PAR 4   PAR 5   PSW     TESTNO  ERR
001566  050014                    DT20        ;PBALO,VIRT1,VIRT2,$REG4,$REG5,$TMP0,TESTNO,$ERRPC,0
001570  050432                    DF20        ;3,0,0,0,0,0,0,0

                        ;*ITEM 21
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 988 001572  042403                    EM21        ;SR2 NOT TRACKING CORRECTLY
 989 001574  046136                    DH21        ;SR2 WAS EXPECTD TESTNO  ERROPC
 990 001576  050036                    DT21        ;WASSR2,$REG1,TESTNO,$ERRPC,0
 991 001600  050375                    DF3         ;0,0,0,0
 992
 993                            ;*ITEM 22
 994 001602  042436                    EM22        ;WRONG PDR'S REFERENCED WHILE IN RELOCATE MODE
 995 001604  046176                    DH22        ;PHYSICL PAR 4
 996                                               ;ADDRESS V.B.A.  PAR 4   SR0 WAS SR2 WAS PSW    TESTNO  ERRO
 997 001606  050050                    DT22        ;PBALO,VIRT1,$REG4,WASSR0,WASSR2,$TMP0,TESTNO,$ERRPC,0
 998 001610  050432                    DF20        ;3,0,0,0,0,0,0,0
 999
1000                            ;*ITEM 23
1001 001612  042514                    EM23        ;PAR OR PDR WAS CHANGED BY A RESET
1002 001614  045216                    DH11        ;REGISTR READ    READ-(BINARY)
1003                                               ;ADDRESS (OCTAL) 5432109876543210  TESTNO  ERRORPC
1004 001616  047704                    DT11        ;$REG0,$REG1,$REG1,TESTNO,$ERRPC,0
1005 001620  050411                    DF11        ;0,0,2,0,0
1006
1007                            ;*ITEM 24
1008 001622  042552                    EM24        ;MAINT MODE (SR0<8>) NOT DISABLED BY A RESET
1009 001624  046314                    DH24        ;TESTNO  ERRORPC
1010 001626  050072                    DT24        ;TESTNO,$ERRPC,0
1011 001630  050442                    DF24        ;0,0
1012
1013                            ;*ITEM 25
1014 001632  042630                    EM25        ;DATA INCORRECT AFTER A MAINT. MODE WRITE
1015 001634  045026                    DH3         ;WROTE   READ    TESTNO  ERRORPC
1016 001636  050100                    DT25        ;$REG1,$REG2,TESTNO,$ERRPC,0
1017 001640  050375                    DF3         ;0,0,0,0
1018
1019                            ;*ITEM 26
1020 001642  042701                    EM26        ;SOURCE RELOCATED IN MAINT. MODE
1021 001644  044727                    DH2         ;OLD PC  OLD PSW R6 WAS  SR0     SR2    TESTNO  ERRORPC
1022 001646  047624                    DT2         ;TRAPPC,TRAPPS,WASR6,WASSR0,WASSR2,TESTNO,$ERRPC,0
1023 001650  050365                    DF2         ;0,0,0,0,0,0,0
1024
1025                            ;*ITEM 27
1026 001652  042741                    EM27        ;SR2 DIDNOT LOCKUP CORRECT VIRTUAL ADDR.
1027 001654  046136                    DH21        ;SR2 WAS EXPECTD TESTNO  ERRORPC
1028 001656  050112                    DT27        ;WASSR2,$REG4,TESTNO,$ERRPC,0
1029 001660  050375                    DF3         ;0,0,0,0
1030
1031                            ;*ITEM 30
1032 001662  043015                    EM30        ;FOLLOWING PAR/PDR WILL NOT ZERO
1033 001664  046334                    DH30        ;ADDRESS DATA    TESTNO  ERRORPC
1034 001666  050124                    DT30        ;$REG0,$REG2,TESTNO,$ERRPC,0
1035 001670  050375                    DF3         ;0,0,0,0
1036
1037                            ;*ITEM 31
1038 001672  043055                    EM31        ;SUMMARY OF DUAL ADDRESSING ERRORS
1039 001674  046374                    DH31        ;ADDROR  ADDRAND ADDROR  ADDRAND
1040                                               ;LOADED  LOADED ENABLED ENABLED TESTNO  #ERRORS
1041 001676  050136                    DT31        ;ADDROR,ADRAND,DATAOR,DATAND,TESTNO,ERRCNT,0
1042 001700  050375                    DF3         ;0,0,0,0,0,1
1043
1044                            ;*ITEM 32
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1045 001702  043117                    EM32            ;SUMMARY OF COUNT PATTERN FAILURES
1046 001704  046513                    DH32            ;ADDROR  ADDRAND PATRNOR PATRNAND DATAOR  DATAAND TESTNO  #E
1047 001706  050154                    DT32            ;ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,TESTNO,ERRCNT,0
1048 001710  050444                    DF32            ;0,0,0,0,0,0,0,1
1049
1050                                ;*ITEM 33
1051 001712  043161                    EM33            ;ERROR IN BYTE ADDRESSING OF PAR/PDR
1052 001714  046613                    DH33            ;ADDRESS EXPECTD RECEIVD TESTNO  ERRORPC
1053 001716  050176                    DT33            ;$REG0,$REG2,$REG1,TESTNO,$ERRPC,0
1054 001720  050452                    DF33            ;0,0,0,0,0
1055
1056                                ;*ITEM 34
1057 001722  043225                    EM34            ;THE FOLLOWING ARE DUAL ADDRESSING ERRORS FOR PAR'S/PDR'S
1058 001724  046663                    DH34            ;ADDRESS ADDRESS
1059                                                   ;LOADED  JUST READ TESTNO
1060 001726  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1061 001730  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1062
1063                                ;*ITEM 35
1064 001732  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1065 001734  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1066 001736  050212                    DT35            ;$REG0,$REG1,TESTNO,0
1067 001740  050360                    DF1             ;0,0,0
1068
1069                                ;*ITEM 36
1070 001742  043316                    EM36            ;THE FOLLOWING ARE COUNT PATTERN ERRORS FOR PAR'S/PDR'S
1071 001744  046703                    DH36            ;ADDRESS DATAREAD PATTERN COUNT   TESTNO
1072 001746  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1073 001750  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1074
1075                                ;*ITEM 37
1076 001752  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1077 001754  000000                    .WORD   0       ;THIS IS A NULL VALUE TO INHIBIT TYPING
1078 001756  050222                    DT37            ;$REG0,$REG2,$REG4,$REG1,TESTNO,0
1079 001760  050401                    DF7             ;0,0,0,0,0
1080
1081                                ;*ITEM 40
1082 001762  043405                    EM40            ;ILLEGAL (MODE 10) STACK POINTER NOT MAPPED TO USER
1083 001764  046752                    DH40            ;READOFF TESTNO  ERRORPC
1084                                                   ;STACK
1085 001766  047660                    DT7             ;$REG0,TESTNO,$ERRPC,0
1086 001770  050401                    DF7             ;0,0,0
1087
1088                                ;*ITEM 41
1089 001772  043470                    EM41            ;18-BIT MAPPING POSSIBLE HOLE IN MAIN MEMORY FROM
1090 001774  047010                    DH41            ;STARTADR  FINISHADR TESTNO  ERRORPC
1091 001776  050236                    DT41            ;$TMP1,$TMP2,TESTNO,$ERRPC,0
1092 002000  050365                    DF2             ;0,0,0,0
1093
1094                                ;*ITEM 42
1095 002002  043551                    EM42            ;FAULTY CARRY PROPAGATION 18-BIT MAPPING
1096 002004  047051                    DH42            ;PATTERN DATA    ADDRESS
1097                                                   ;LOADED  FETCHED INTENDED  TESTNO  ERRORPC
1098 002006  050250                    DT42            ;$REG2,$REG3,$REG0,TESTNO,$ERRPC,0
1099 002010  050365                    DF2             ;0,0,0,0,0
1100
1101                                ;*ITEM 43
```

```
1102 002012  043621                    EM43          ;18-BIT MAPPING POSSIBLE HOLE AT TOP OF MEMORY
1103 002014  047153                    DH43          ;STARTADR  TESTNO  ERRORPC
1104 002016  050264                    DT43          ;$TMP1,TESTNO,$ERRPC,0
1105 002020  050462                    DF43          ;4,0,0
1106
1107                          ;*ITEM 44
1108 002022  043677                    EM44          ;NO TRAP THRU ERRVEC,AT 18-BIT ADDR. 760000
1109 002024  046314                    DH24          ;TESTNO  ERRORPC
1110 002026  050072                    DT24          ;TESTNO,$ERRPC,0
1111 002030  050442                    DF24          ;0,0
1112
1113                          ;*ITEM 45
1114 002032  043752                    EM45          ;DIDN'T GET WRAP AROUND TO ADDRESS ZERO
1115 002034  047203                    DH45          ;DATA    TESTNO  ERRORPC
1116 002036  050274                    DT45          ;$REG1,TESTNO,$ERRPC,0
1117 002040  050401                    DF7           ;0,0,0
1118
1119                          ;*ITEM 46
1120 002042  044021                    EM46          ;NO TRAP THRU ERRVEC, ON NON-EXISTANT ADDR.
1121 002044  047233                    DH46          ;NEADDR TESTNO  ERRORPC
1122 002046  047660                    DT7           ;$REG0,TESTNO,$ERRC,0
1123 002050  050401                    DF7           ;0,0,0
1124
1125                          ;*ITEM 47
1126 002052  044074                    EM47          ;PREMATURE END OF MEMORY FOUND
1127 002054  047262                    DH47          ;KIPAR4  LASTBK  TESTNO  ERRORPC
1128 002056  050304                    DT47          ;KIPAR4,$LSTBK,TESTNO,$ERRPC,0
1129 002060  050365                    DF2           ;0,0,0,0
1130
1131                          ;*ITEM 50
1132 002062  044132                    EM50          ;22-BIT MAPPING POSSIBLE HOLE IN MAIN MEMORY FROM
1133 002064  047010                    DH41          ;STARTBK FINISHBK TESTNO  ERRORPC
1134 002066  050236                    DT41          ;$TMP1,$TMP2,TESTNO,$ERRPC,0
1135 002070  050365                    DF2           ;0,0,0,0
1136
1137                          ;*ITEM 51
1138 002072  044213                    EM51          ;BAD RELOCATION,CARRY PROPAGATION 22-BIT MAPPING
1139 002074  047051                    DH42          ;PATTERN DATA    ADDRESS
1140                                                 ;LOADED  FETCHED INTENDED  TESTNO  ERRORPC
1141 002076  050250                    DT42          ;$REG2,$REG3,$REG0,TESTNO,$ERRPC,0
1142 002100  050365                    DF2           ;0,0,0,0,0
1143
1144                          ;*ITEM 52
1145 002102  044273                    EM52          ;22-BIT MAPPING POSSIBLE HOLE AT TOP OF MEMORY
1146 002104  047153                    DH43          ;STARTADR  TESTNO  ERRORPC
1147 002106  050264                    DT43          ;$TMP1,TESTNO,$ERRPC,0
1148 002110  050365                    DF2           ;0,0,0
1149
1150                          ;*ITEM 53
1151 002112  044351                    EM53          ;DID NOT GET UNIBUS ADDRESS
1152 002114  047051                    DH42          ;PATTERN DATA    ADDRESS
1153                                                 ;LOADED  FETCHED INTENDED  TESTNO  ERRORPC
1154 002116  050250                    DT42          ;$REG2,$REG3,$REG0,TESTNO,$ERRPC,0
1155 002120  050365                    DF2           ;0,0,0,0,0
1156
1157                          ;*ITEM 54
1158 002122  044404                    EM54          ;W-BIT DID NOT GET SET IN PDR
```

```
1159 002124  047326                    DH54          ;PDR     VIRTUAL
1160                                                 ;TESTED  ADDRESS TESTNO  ERRORPC
1161 002126  050316                    DT54          ;$REG5,$REG3,TESTNO,$ERRPC,0
1162 002130  050375                    DF3           ;0,0,0,0
1163
1164                              ;*ITEM 55
1165 002132  044441                    EM55          ;W-BIT SET IN MORE THAN ONE PDR
1166 002134  047406                    DH55          ;PDR IN  PDR     VIRTUAL
1167                                                 ;ERROR   TESTED  ADDRESS TESTNO  ERRORPC
1168 002136  050330                    DT55          ;$REG0,$REG5,$REG3,TESTNO,$ERRPC,0
1169 002140  050360                    DF1           ;0,0,0,0,0
1170
1171                              ;*ITEM 56
1172 002142  044500                    EM56          ;W-BIT NOT CLEARED BY WRITING TO PDR
1173 002144  047506                    DH56          ;PDR     TESTNO  ERRORPC
1174 002146  050344                    DT56          ;$REG5,TESTNO,$ERRPC,0
1175 002150  050401                    DF7           ;0,0,0
1176
1177                              ;*ITEM 57
1178 002152  044544                    EM57          ;W-BIT GOT SET DURING ODD ADDR. ABORT
1179 002154  047536                    DH57          ;PDR WAS EXPECTD TESTNO  ERRORPC
1180 002156  047750                    DT15          ;$REG2,$REG1,TESTNO,$ERRPC,0
1181 002160  050375                    DF3           ;0,0,0,0
1182
1183                              ;*ITEM 60
1184 002162  044611                    EM60          ;NO APT SPECIAL HARDWARE FOUND
1185 002164  047576                    DH60          ;ERRORPC
1186 002166  050354                    DT60          ;$ERRPC,0
1187 002170  050360                    DF1           ;0
```

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

                                        .SBTTL  TURN OFF T-BIT AND SAVE CURRENT PSW
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE IS USED TO TURN OFF THE TRACE TRAP BIT IN
                                        ;*      THE PSW IF IT IS ON.  THE PROCESSOR STATUS IS SAVED IN
                                        ;*      'TBITPS'' SO THAT THE PSW CAN BE RESTORED TO ITS PREVIOUS
                                        ;*      CONDITION WHEN CONDITIONS WARRANT T-BIT TRAPPING.
                                        ;*
                                        ;;*****************************************************************
002172  036727  175600  000020  TOFF:   BIT     PSW,#TBIT       ;IS THE T-BIT SET IN THE PSW?
002200  001411                          BEQ     1$              ;EXIT IF NO
002202  016746  175570                  MOV     PSW,-(SP)       ;PUSH PRESENT PSW ON THE STACK
002206  011667  177060                  MOV     (SP),TBITPS     ;ALSO SAVE IT IN 'TBITPS'' FOR
                                                                ;RESTORING LATER
002212  042716  000020                  BIC     #TBIT,(SP)      ;CLEAR THE T-BIT (BIT 4) IN THE PSW
002216  012746  002224                  MOV     #1$,-(SP)       ;PUSH PC OF 'RTS'' ON STACK
002222  000006                          RTT                     ;'RETURN'' TO 1$ WITH T-BIT OFF
002224  000207                  1$:     RTS     PC              ;RETURN TO PROGRAM

                                        .SBTTL  TURN ON T-BIT AND RESTORE PREVIOUS PSW
                                        ;;*****************************************************************
                                        ;*
                                        ;*      THIS SUBROUTINE IS USED TO RESTORE THE PROCESSOR STATUS
                                        ;*      TO ITS PREVIOUS CONDITION BY RESTORING THE 'T-BIT PSW''
                                        ;*      SAVED BY THE 'TOFF'' SUBROUTINE IN THE 'TBITPS'' LOCATION.
                                        ;*
                                        ;;*****************************************************************
002226  036727  177040  000020  TON:    BIT     TBITPS,#TBIT    ;WAS T-BIT ON IN THE PREVIOUS PSW?
002234  001410                          BEQ     1$              ;EXIT IF NO
002236  016746  177030                  MOV     TBITPS,-(SP)    ;PUSH PREVIOUS PSW ON THE STACK
002242  012767  000340  177022          MOV     #340,TBITPS     ;RESET THE 'TBITPS'' LOCATION
002250  012746  002256                  MOV     #1$,-(SP)       ;PUSH PC OF 'RTS'' ON STACK
002254  000006                          RTT                     ;'RETURN'' TO 1$ WITH T-BIT RESTORED
002256  000207                  1$:     RTS     PC              ;RETURN TO PROGRAM

                                        .SBTTL  CLEAR 16 PAR'S OR PDR'S STARTING FROM ADDRESS IN R5
                                        ;;*****************************************************************
                                        ;*      THIS ROUTINE CLEARS 16 CONSECUTIVE MEMORY MANAGEMENT
                                        ;*      REGISTERS STARTING WITH THE REGISTER POINTED TO BY R5.
                                        ;*      IT SAVES R0 ON THE STACK, AND LOADS A COUNT IN R0,
                                        ;*      CLEARS THE PAR'S OR PDR'S, AND THEN RESTORES R0
                                        ;*      BEFORE RETURNING.
                                        ;*
                                        ;*      CALL:   MOV     #KIPAR0,R5      ;PUT ADDRESS OF FIRST KERNAL PAR INTO R5
                                        ;*              JSR     PC,CLRREG       ;CLEAR ALL THE KERNAL PAR'S
                                        ;;*****************************************************************

002260  010046          CLRREG: MOV     R0,-(KSP)       ;SAVE R0 ON THE STACK
002262  012700  000020          MOV     #20,R0          ;PUT COUNT IN R0
002266  005025          1$:     CLR     (R5)+           ;CLEAR PAR OR PDR POINTED TO BY R5
002270  077002                  SOB     R0,1$           ;BRANCH BACK 15 DECIMAL TIMES
002272  012600                  MOV     (KSP)+,R0       ;POP R0 FROM STACK
002274  000207                  RTS     PC              ;RETURN TO TEST
```

```
                                .SBTTL  CLEANUP LOCATIONS THAT HOLD LOGICAL 'AND' AND 'OR'
                                ;;*****************************************************************
                                ;*      THIS SUBROUTINE IS USED TO INITIALIZE ALL LOCATIONS THAT
                                ;*      HOLD THE ''LOGICAL AND'' AND ''LOGICAL OR'' OF THE DATA AND
                                ;*      ADDRESSES THAT FAILED DURING THE EXECUTION OF A TEST.
                                ;;*****************************************************************

002276                          CLEANUP:
002276  005067  177004                  CLR     DATAOR          ;LOCATION OF LOGICAL OR OF BAD DATA
002302  005067  177010                  CLR     ADDROR          ;LOCATION OF LOGICAL OR OF ADDRESS
002306  005067  177000                  CLR     PATTOR          ;LOCATION OF LOGICAL OR OF PATTERN LOADED
002312  012700  177777                  MOV     #-1,R0          ;LOAD -1 INTO R0 TO INITIALIZE
002316  010067  176766                  MOV     R0,DATAND       ;LOCATION OF LOGICAL AND OF BAD DATA
002322  010067  176772                  MOV     R0,ADRAND       ;LOCATION OF LOGICAL AND OF ADDRESS
002326  010067  176762                  MOV     R0,PATAND       ;LOCATION OF LOGICAL AND OF PATTERN LOADED
002332  000207                          RTS     PC              ;RETURN TO TEST

                                .SBTTL  DUAL ADDRESSING WHEN LOADING A PAR OR PDR
                                ;;*****************************************************************
                                ;*      THIS SUBROUTINE WILL LOG AND REPORT ALL DUAL ADDRESSING ERRORS
                                ;*      FOUND IN BOTH PAR'S AND PDR'S.  A ''LOGICAL OR'' AND A ''LOGICAL
                                ;*      AND'' OF THE WRITTEN ADDRESSES WILL BE MAINTAINED IN 'ADDROR',
                                ;*      AND 'ADRAND'.  THE LOG ON THE ADDITIONAL OR FAILING ADDRESSES
                                ;*      WILL BE MAINTAINED IN 'DATAOR' AND 'DATAND'.
                                ;;*****************************************************************

002334                          DUALADR:
002334  012667  176766                  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
002340  050067  176752                  BIS     R0,ADDROR       ;LOGICAL OR OF WRITTEN ADDRESS
002344  030067  176750                  BIT     R0,ADRAND       ;LOGICAL AND OF WRITTEN ADDRESS
002350  050167  176732                  BIS     R1,DATAOR       ;LOGICAL OR OF DUALED DATA
002354  030167  176730                  BIT     R1,DATAND       ;LOGICAL AND OF DUALED DATA
002360  105767  176517                  TSTB    $ERFLG          ;SEE IF THIS IS FIRST ERROR
002364  001002                          BNE     1$              ;BRANCH IF NOT FIRST ERROR
002366  104034                          ERROR   +34
002370  000401                          BR      2$              ;BRANCH TO EXIT
002372  104035                  1$:     ERROR   +35
002374  000177  176726          2$:     JMP     @OLDPC          ;RETURN TO TEST

                                .SBTTL  COUNT PATTERN ERRORS IN PAR'S OR PDR'S
                                ;;*****************************************************************
                                ;*      THIS SUBROUTINE IS USED TO LOG AND REPORT THE COUNT PATTERN
                                ;*      ERRORS OCCURRING WHEN TESTING THE PAR'S AND PDR'S.  THE
                                ;*      ''LOGICAL OR'' AND ''LOGICAL AND'' OF VARIOUS DATA WILL BE
                                ;*      MAINTAINED A FOLLOWS:
                                ;*              1. ADDRESSES OF FAILED REGISTERS IN 'ADDROR' AND 'ADRAND'
                                ;*              2. DATA FETCHED FROM REGISTERS IN 'DATAOR' AND 'DATAND'
                                ;*              3. PATTERN LOADED INTO REGISTERS IN 'PATTOR' AND 'PATAND'.
                                ;;*****************************************************************

002400                          PARCOUNT:
002400  012667  176722                  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS IN CASE OF LOOP
002404  050067  176706                  BIS     R0,ADDROR       ;LOGICAL OR OF FAILING ADDRESS
002410  030067  176704                  BIT     R0,ADRAND       ;LOGICAL AND OF FAILING ADDRESS
002414  050167  176672                  BIS     R1,PATTOR       ;LOGICAL OR OF PATTERN LOADED
002420  030167  176670                  BIT     R1,PATAND       ;LOGICAL AND OF PATTERN LOADED
002424  050267  176656                  BIS     R2,DATAOR       ;LOGICAL OR OF DATA FETCHED
002430  030267  176654                  BIT     R2,DATAND       ;LOGICAL AND OF DATA FETCHED
```

```
1303 002434  105767  176443                    TSTB    $ERFLG          ;SEE IF THIS IS THE FIRST ERROR
1304 002440  001002                            BNE     1$              ;BRANCH IF NOT FIRST ERROR
1305 002442  104036                            ERROR   +36
1306 002444  000401                            BR      2$              ;BRANCH TO EXIT
1307 002446  104037                      1$:   ERROR   +37
1308 002450  000177  176652                2$:   JMP     @OLDPC          ;RETURN TO TEST
1309
1310                                           ;*CALL:
                                               ;*      JSR     PC,$SIZE
                                               ;*      RETURN
                                               ;*$LSTAD WILL CONTAIN:
                                               ;*      WITH KT11 OPTION        -- LAST VIRTUAL ADDRESS OF THE LAST BANK
                                               ;*      WITHOUT KT11 OPTION     -- LAST ABSOLUTE ADDRESS OF AVAILABLE MEMORY
                                               ;*$LSTBK WILL CONTAIN THE LAST BANK AS A SAF
                                               ;*BIT07 = 0 DON'T USE MEMORY MANAGEMENT
                                               ;*      MUST BE SETUP BEFORE TH CALL
                                               ;*BIT15 = 0 DON'T HAVE MEMORY MANAGEMENT OPTION
                                               ;*      DETERMINED BY ROUTINE
                                               ;*$LSTAD WILL CONTAIN THE LAST AVAILABLE MEMORY LOCATION
     002454  010046                    $SIZE:  MOV     R0,-(SP)        ;;SAVE R0 ON THE STACK
     002456  010146                            MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
     002460  010246                            MOV     R2,-(SP)        ;;SAVE R2 ON THE STACK
     002462  010346                            MOV     R3,-(SP)        ;;SAVE R3 ON THE STACK
     002464  013746  000004                    MOV     @#ERRVEC,-(SP)  ;;SAVE PRESENT ERROR VECTOR PS & PC
     002470  013746  000006                    MOV     @#ERRVEC+2,-(SP)
     002474  010600                            MOV     SP,R0           ;;SAVE THE STACK POINTER
                                           ;;SET THE ERRVEC PS TO THE PRESENT PS
     002476  104400                            TRAP                    ;;PUSH OLD PSW AND PC ON STACK
     002500  012637  000006                    MOV     (SP)+,@#ERRVEC+2;;SAVE THE PSW IN @#ERRVEC+2
     002504  012701  003776                    MOV     #3776,R1        ;;SETUP ADDRESS
     002510  105727                            TSTB    (PC)+           ;;USE MEMORY MANAGEMENT?
     002512  000200                    $KT11:  .WORD   200             ;;SET TO USE MEMORY MANAGEMENT
     002514  100070                            BPL     $CORE           ;;BR IF NO
     002516  012737  002670  000004            MOV     #$KTNEX,@#ERRVEC;;SET FOR TIMEOUT
     002524  005737  177572                    TST     @#SR0           ;;KT11 ARE YOU THERE?
     002530  052767  100000  177754            BIS     #100000,$KT11   ;;YES--SET KT11 KEY
     002536  012737  003122  000250            MOV     #MGMERR,@#MMVEC ;;SET IN CASE OF ERROR
     002544  012737  000340  000252            MOV     #340,@#MMVEC+2
     002552  005046                            CLR     -(SP)           ;;INITIALIZE FOR 'PAR' LOADING
     002554  012702  172340                    MOV     #KIPAR0,R2      ;;ADDRESS OF FIRST 'PAR'
     002560  012703  000010                    MOV     #^D8,R3         ;;LOAD EIGHT 'PAR.'S' AND EIGHT 'PDR.'S'
     002564  012762  077406  177740      1$:   MOV     #77406,-40(R2)  ;;PDR = 4K, UP, READ/WRITE
     002572  011622                            MOV     (SP),(R2)+      ;;LOAD 'PAR'
     002574  062716  000200                    ADD     #200,(SP)       ;;UPDATE FOR NEXT 'PAR'
     002600  077307                            SOB     R3,1$           ;;LOOP UNTIL ALL EIGHT ARE LOADED
     002602  012742  177600                    MOV     #177600,-(R2)   ;;SETUP KIPAR7 FOR I/O
     002606  005042                            CLR     -(R2)           ;;SETUP KIPAR6 FOR TESTING.
     002610  012737  002626  000004            MOV     #2$,@#ERRVEC    ;;CATCH TIMEOUT IF NO SR3
     002616  012737  000020  172516            MOV     #20,@#SR3       ;;ENABLE 22 BIT MODE
     002624  000401                            BR      3$              ;;THIS PDP-11 HAS A SR3 REGISTER
     002626  022626                      2$:   CMP     (SP)+,(SP)+     ;;CLEAN OFF TE STAC--NO SR3
     002630  005237  177572                3$:   INC     @#SR0           ;;TURN ON MEMORY MANAGEMENT
     002634  012737  002660  000004            MOV     #$KTOUT,@#ERRVEC;;SET FOR TIME OUT
     002642  005737  143776                4$:   TST     @#143776        ;;TRAP ON NON-EX-MEM
     002646  062712  000040                    ADD     #40,(R2)        ;;MAKE A 1K STEP
     002652  023712  172356                    CMP     @#KIPAR7,(R2)   ;;LAST ONE?
     002656  101371                            BHI     4$              ;;NO--TRY IT
```

```
002660  011202                  $KTOUT: MOV     (R2),R2         ;;GET LAST BANK+1
002662  005037  177572                  CLR     @#SR0           ;;TURN OFF MEMORY MANAGEMENT
002666  000421                          BR      $SIZEX
002670  042767  100000  177614  $KTNEX: BIC     #100000,$KT11   ;;KT11 NON-EXISTENT
002676  012737  002726  000004  $CORE:  MOV     #$CROUT,@#ERRVEC;;SET FOR TIMEOUT
002704  005002                          CLR     R2              ;;SET UP BANK
002706  062701  004000          1$:     ADD     #4000,R1        ;;INCREMENT BY 1K
002712  062702  000040                  ADD     #40,R2          ;;1K STEP
002716  005711                          TST     (R1)            ;;TRAP ON TIME OUT
002720  022701  177776                  CMP     #177776,R1      ;;LAST ONE
002724  001370                          BNE     1$              ;;NO--TRY AGAIN
002726  162701  004000  $CROUT: SUB     #4000,R1
002732  162702  000040  $SIZEX: SUB     #40,R2          ;;DROP BACK
002736  012737  002754  000004          MOV     #2$,@#ERRVEC    ;;SET FOR TIMEOUT
002744  012701  020000                  MOV     #20000,R1       ;;FIRST ADDRESS
002750  005721                  1$:     TST     (R1)+           ;;TEST AND STEP TO NEXT ADDRESS
002752  000776                          BR      1$              ;;TRY ANOTHER
002754  162701  000002          2$:     SUB     #2,R1           ;;DROP BACK
002760  010006                          MOV     R0,SP           ;;RESTORE THE STACK
002762  012637  000006                  MOV     (SP)+,@#ERRVEC+2;;RESTORE ERROR VECTOR
002766  012637  000004                  MOV     (SP)+,@#ERRVEC
002772  010167  000022                  MOV     R1,$LSTAD       ;;LAST ADDRESS
002776  010267  000020                  MOV     R2,$LSTBK       ;;LAST BANK
003002  012603                          MOV     (SP)+,R3        ;;RESTORE R3
003004  012602                          MOV     (SP)+,R2        ;;RESTORE R2
003006  012601                          MOV     (SP)+,R1        ;;RESTORE R1
003010  012600                          MOV     (SP)+,R0        ;;RESTORE R0
003012  005067  174750                  CLR     CPUERR          ;CLEAR THE ERROR REGISTER
003016  000207                          RTS     PC
003020  000000          $LSTAD: .WORD   0               ;;CONTAINS THE LAST ADDRESS
003022  000000          $LSTBK: .WORD   0               ;;CONTAINS THE LAST BANK
1311
1312                            .SBTTL  ***** TRAP HANDLING ROUTINES *****
1313
1314                    .SBTTL  CPU TRAP HANDLER ROUTINE
1315                    ;;*******************************************************************
1316                    ;*
1317                    ;*      THIS SUBROUTINE WILL HANDLE ALL CPU TRAPS AND ABORTS THRU
1318                    ;*      "ERRVEC" (LOC. 004).  IF THIS SUBROUTINE IS ENTERED BY A
1319                    ;*      SECOND TRAP BEFORE THE FIRST HAS BEEN SERVICED, A HALT IS
1320                    ;*      EXECUTED.
1321                    ;*
1322                    ;;*******************************************************************
1323 003024  005227  TIMERR: INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME THRU
1324 003026  177777  TIMFLG: .WORD   -1              ;NEGATIVE ONE FOR "HAVE ENTERED" FLAG
1325 003030  001401          BEQ     1$              ;BRANCH IF FIRST TIME IN
1326 003032  000000          HALT                    ;STOP! - I'VE ENTERED THIS ROUTINE
1327                                                 ;A SECOND TIME BEFORE I FINISHED
1328                                                 ;REPORTING THE FIRST ERROR.  THE
1329                                                 ;SECOND ENTRY ADDRESS SHOULD BE ON
1330                                                 ;THE KERNEL STACK.
1331 003034  012667  176220  1$:     MOV     (KSP)+,TRAPPC   ;SAVE PC+2 AT TIME OF ABORT
1332 003040  012667  176216          MOV     (KSP)+,TRAPPS   ;SAVE PS AT TIME OF ABORT
1333 003044  016767  174716  176260  MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER
1334 003052  010667  176200          MOV     KSP,WASR6       ;SAVE STACK POINTER VALUE
1335 003056  005767  176252          TST     CPUEXP          ;SEE IF ANY ERROR CONDITION WAS EXPECTED
1336 003062  001404                  BEQ     2$              ;BRANCH IF NO TRAP EXPECTED
```

```
1337 003064  026767  176242  176242          CMP     PCPUER,CPUEXP   ;SEE IF EXPECTED CONDITION OCCURED
1338 003072  001401                          BEQ     3$              ;BRANCH IF ERROR CODES MATCH
1339 003074  104001                  2$:     ERROR   +1              ;UNEXPECTED TRAP OR ABORT TO LOC. 4
1340 003076  005067  174664          3$:     CLR     CPUERR          ;CLEAR CPU ERROR REGISTER
1341 003102  012767  177777  177716          MOV     #-1,TIMFLG      ;MAKE FLAG NEGATIVE ONE FOR NEXT TIME
1342 003110  016746  176146                  MOV     TRAPPS,-(KSP)   ;PUT PC & PS OF TRAP ON STACK
1343 003114  016746  176140                  MOV     TRAPPC,-(KSP)
1344 003120  000006                          RTT                     ;RETURN FROM INTERRUPT OR ABORT
1345
1346
1347                                  .SBTTL  MEMORY MANAGEMENT TRAP HANDLER ROUTINE
1348                                  ;;**********************************************************************
1349                                  ;*
1350                                  ;*      THIS SUBROUTINE WILL HANDLE ALL UNEXPECTED MEMORY MANAGEMENT
1351                                  ;*      TRAPS AND ABORTS THRU 'MMVEC' (LOC. 250).  IF THIS SUBROUTINE IS
1352                                  ;*      ENTERED BY A SECOND TRAP BEFORE THE FIRST HAS BEEN SERVICED, A
1353                                  ;*      HALT IS EXECUTED.
1354                                  ;*
1355                                  ;;**********************************************************************
1356 003122  005227                  MGMERR: INC     (PC)+           ;MAKE FLAG ZERO IF FIRST TIME THRU
1357 003124  177777                  MGMFLG: .WORD   -1              ;NEGATIVE ONE FOR 'HAVE ENTERED' FLAG
1358 003126  001401                          BEQ     1$              ;BRANCH IF FIRST TIME IN
1359 003130  000000                          HALT                    ;STOP! - I'VE ENTERED THIS ROUTINE
1360                                                                 ;A SECOND TIME BEFORE I FINISHED
1361                                                                 ;REPORTING THE FIRST ERROR.  THE
1362                                                                 ;SECOND ENTRY ADDRESS SHOULD BE ON
1363                                                                 ;THE KERNEL STACK.
1364 003132  012667  176122          1$:     MOV     (KSP)+,TRAPPC   ;SAVE PC+2 AT TIME OF ABORT
1365 003136  012667  176120                  MOV     (KSP)+,TRAPPS   ;SAVE PS AT TIME OF ABORT
1366 003142  010667  176110                  MOV     KSP,WASR6       ;SAVE STACK POINTER VALUE
1367 003146  016767  174420  176110          MOV     SR0,WASSR0      ;SAVE CONTENTS OF KT STATUS REG. 0
1368 003154  016767  174414  176104          MOV     SR1,WASSR1      ;SAVE CONTENTS OF KT STATUS REG. 1
1369 003162  016767  174410  176100          MOV     SR2,WASSR2      ;SAVE CONTENTS OF KT STATUS REG. 2
1370 003170  042767  160000  174374          BIC     #160000,SR0     ;CLEAR ERROR BITS IN STATUS REG 0
1371 003176  104002                          ERROR   +2              ;UNEXPECTED TRAP OR ABORT TO LOC. 250
1372 003200  012767  177777  177716          MOV     #-1,MGMFLG      ;MAKE FLAG NEGATIVE ONE FOR NEXT TIME
1373 003206  016746  176050                  MOV     TRAPPS,-(KSP)   ;PUT PC & PS OF TRAP ON STACK
1374 003212  016746  176042                  MOV     TRAPPC,-(KSP)
1375 003216  000006                          RTT                     ;RETURN FROM INTERRUPT OR ABORT.
1376
1377                                  .SBTTL  CONVERT VIRTUAL ADDRESS TO PHYSICAL ADDRESS
1378                                  ;;**********************************************************************
1379                                  ;*
1380                                  ;*      THIS SUBROUTINE IS USED TO FORM AN 22-BIT PHYSICAL ADDRESS
1381                                  ;*      (PBA) FROM THE 16-BIT VIRTUAL ADDRESS (VBA) AND THE APPROPRIATE
1382                                  ;*      PAGE ADDRESS REGISTER (PAR).  THE SAME METHOD USED BY THE MEMORY
1383                                  ;*      MANAGEMENT LOGIC IS USED.  VBA <15:13> SELECTS WHICH PAR/PDR
1384                                  ;*      IS TO BE USED, VBA <5:0>+PBA <5:0>, AND VBA <12:6> IS ADDED
1385                                  ;*      TO PAR <15:00> TO GIVE PBA <21:6>.  BITS <21:16> OF THE
1386                                  ;*      PHYSICAL ADDRESS ARE LEFT IN LOC. 'PBAHI' AND BITS <15:00>
1387                                  ;*      ARE LEFT IN LOC. 'PBALO'.  THE PSW'S 'CURRENT MODE' BITS
1388                                  ;*      ARE USED TO SELECT THE KERNEL,SUPERVISOR OR USER PAR/PDR'S.
1389                                  ;*      THE ROUTINE IS ENTERED WITH LOC. 'VIRT1' CONTAINING THE 16-BIT
1390                                  ;*      VIRTUAL ADDRESS.
1391                                  ;*
1392                                  ;;**********************************************************************
1393
```

```
1394 003220  012702  172340          FORMPA: MOV     #KIPAR0,R2      ;LOAD ADDRESS OF FIRST KERNEL PAR IN R2
1395 003224  032767  140000  174544          BIT     #140000,PSW     ;IN USER MODE?
1396 003232  001403                          BEQ     1$              ;BRANCH IF NO
1397 003234  012702  177640                  MOV     #UIPAR0,R2      ;LOAD ADDRESS OF FIRST USER PAR IN R2
1398 003240  000406                          BR      2$              ;BRANCH WHEN DONE
1399 003242  032767  040000  174526  1$:     BIT     #40000,PSW      ;IN SUPERVISOR MODE?
1400 003250  001402                          BEQ     2$              ;BRANCH IF NO
1401 003252  012702  172240                  MOV     #SIPAR0,R2      ;LOAD ADDRESS OF FIRST SUPERVISOR PAR IN R2
1402 003256  016700  176014          2$:     MOV     VIRT1,R0        ;LOAD VIRTUAL ADDR. (VBA) INTO R0
1403 003262  072027  177764                  ASH     #-14,R0         ;GET BITS <15:13> DOWN TO BITS <3:1>
1404 003266  042700  177761                  BIC     #177761,R0      ;MASK OF ALL BITS BUT BITS <3:1>
1405 003272  060002                          ADD     R0,R2           ;ADD OFFSET TO BASE PAR ADDRESS
1406 003274  011200                          MOV     (R2),R0         ;GET BITS <15:00> FROM APPROPRIATE PAR
1407 003276  010002                          MOV     R0,R2           ;COPY PAR BITS <15:00> INTO R2
1408 003300  016767  175772  175774          MOV     VIRT1,PBALO     ;PUT VIRTUAL ADDR. IN LOC. 'PBALO'
1409 003306  042767  160000  175766          BIC     #160000,PBALO   ;CLEAR OFF BITS <15:13> OF ORIGINAL VBA
1410 003314  072227  177766                  ASH     #-12,R2         ;GET PAR <15:00> DOWN TO BITS <1:0> OF R2
1411 003320  042702  177774                  BIC     #177774,R2      ;CLEAR OFF ALL BITS BUT BITS <1:0>
1412 003324  072027  000006                  ASH     #6,R0           ;SHIFT PAR<9:0> TO <15:6> OF R0
1413 003330  042700  000077                  BIC     #77,R0          ;CLEAR BITS <5:0> OF R0
1414 003334  060067  175742                  ADD     R0,PBALO        ;IN EFFECT, ADD VBA<12:0> TO PAR<9:0>
1415                                                                 ;(PAR<9:0> IN BITS <15:6> OF R0)
1416 003340  005502                          ADC     R2              ;ADD ANY CARRY TO R2
1417 003342  010267  175736                  MOV     R2,PBAHI        ;PUT BITS <21:16> OF PHYSICAL ADDR. IN PBAHI
1418 003346  000207                          RTS     PC              ;RETURN TO PROGRAM
```

```
1420                                            .SBTTL  *****   STARTING POINT OF TEST  *****
1421                                            .SBTTL  *****   STARTING ADDRESS OF 200 *****
1422            020000                          .=20000
1423
1424 020000                            START:
                                       .SBTTL  INITIALIZE THE COMMON TAGS
                                       ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
       020000  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
       020004  005026                          CLR     (R6)+           ;;CLEAR MEMORY LOCATION
       020006  022706  001140                  CMP     #SWR,R6 ;;DONE?
       020012  001374                          BNE     .-6             ;;LOOP BACK IF NO
       020014  012706  001100                  MOV     #STACK,SP       ;;SETUP THE STACK POINTER
                                       ;;INITIALIZE A FEW VECTORS
       020020  012737  035174  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
       020026  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
       020034  012737  035366  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
       020042  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
       020050  012737  040770  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
       020056  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
       020064  012737  041056  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
       020072  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
       020100  016767  014640  014630          MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
       020106  005067  161100                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
       020112  112767  000001  160775          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
                                       ;;INITIALIZE THE "T-BIT" TRAP VECTOR. THEN LOAD LOCATION "$RTRN", IN
                                       ;;THE "END-OF-PASS" ($EOP) ROUTINE, WITH A "RTI" OR "RTT".
       020120  012737  035162  000014          MOV     #$RTRN,@#TBITVEC ;;SET "T" BIT VECTOR TO $RTRN
       020126  012737  000340  000016          MOV     #340,@#TBITVEC+2 ;;LEVEL 7
       020134  012767  000002  015020          MOV     #RTI,$RTRN      ;;SET $RTRN TO A RTI
       020142  012737  020170  000010          MOV     #65$,@#RESVEC   ;;TRY TO DO A RTT
       020150  005046                          CLR     -(SP)           ;;DUMMY PS
       020152  012746  020160                  MOV     #64$,-(SP)      ;;AND PC
       020156  000006                          RTT                     ;;TRY THE RTT
       020160  012767  000006  014774  64$:    MOV     #RTT,$RTRN      ;;RTT IS LEGAL--SET $RTRN TO A RTT
       020166  000402                          BR      66$
       020170  062706  000010          65$:    ADD     #10,SP          ;;RTT ILLEGAL--CLEAN OFF THE STACK
       020174  012737  000012  000010  66$:    MOV     #RESVEC+2,@#RESVEC ;;RESTORE TRAP CATCHER
       020202  005067  161140                  CLR     $TBIT           ;;CLEAR "T" BIT SWITCH
       020206  012767  020206  160672          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
       020214  012767  020214  160666          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                       ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                       ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
       020222  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
       020226  012737  020262  000004          MOV     #67$,@#ERRVEC   ;;SET UP ERROR VECTOR
       020234  012767  177570  160676          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
       020242  012767  177570  160672          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
       020250  022777  177777  160662          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
       020256  001012                          BNE     69$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                       ;;AND  THE HARDWARE SWR IS NOT = -1
       020260  000403                          BR      68$             ;;BRANCH IF NO TIMEOUT
       020262  012716  020270          67$:    MOV     #68$,(SP)       ;;SET UP FOR TRAP RETURN
       020266  000002                          RTI
       020270  012767  000176  160642  68$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
       020276  012767  000174  160636          MOV     #DISPREG,DISPLAY
       020304  012637  000004          69$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
       020310  005067  160716                  CLR     $PASS           ;;CLEAR PASS COUNT
       020314  132767  000200  160723          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
```

```
020322  001403                          BEQ     70$             ;;YES,USE NON-APT SWITCH
020324  012767  001246  160606          MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
020332                          70$:
1425                            .SBTTL  TYPE PROGRAM NAME
                                ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
020332  005227  177777                  INC     #-1             ;;FIRST TIME?
020336  001047                          BNE     71$             ;;BRANCH IF NO
020340  022737  035116  000042          CMP     #$ENDAD,@#42    ;;ACT-11?
020346  001443                          BEQ     71$             ;;BRANCH IF YES
020350  104401  020416                  TYPE    ,72$            ;;TYPE ASCIZ STRING
                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
020354  005737  000042                  TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
020360  001012                          BNE     73$             ;;BRANCH IF YES
020362  126727  160656  000001          CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
020370  001406                          BEQ     73$             ;;BRANCH IF YES
020372  026727  160542  000176          CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
020400  001005                          BNE     74$             ;;BRANCH IF NO
020402  104407                          GTSWR                   ;;GET SOFT-SWR SETTINGS
020404  000403                          BR      74$
020406  112767  000001  160520  73$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
020414                          74$:
020414  000420                          BR      71$             ;;GET OVER THE ASCIZ
                                ;;72$:  .ASCIZ  <CRLF>#CKKTAA0 11/44 MEM MGMT PRT A#<CRLF>
020456                          71$:
1426
1427 020456                     LOOP:
1428 020456  012706  001100            MOV     #STACK,KSP      ;INITIALIZE THE STACK POINTER
1429 020462  012767  003024  157314    MOV     #TIMERR,ERRVEC  ;LOAD CPU SERVICE ROUTINE INTO TRAP VECTOR
1430 020470  012767  000340  157310    MOV     #340,ERRVEC+2   ;SET NEW PS TO PRIORITY LEVEL 7-KERNEL
1431 020476  012767  003122  157544    MOV     #MGMERR,MMVEC   ;LOAD MEMORY MANAGENT ROUTINE INTO VECTOR
1432 020504  012767  000340  157540    MOV     #340,MMVEC+2    ;SET NEW PS TO PRIORITY LEVEL 7-KERNEL
1433 020512  012700  177777            MOV     #-1,R0          ;PUT -1 INTO R0 TO INITIALIZE FLAGS
1434 020516  010067  162304            MOV     R0,TIMFLG       ;INITIALIZE CPU ERROR FLAG
1435 020522  010067  162376            MOV     R0,MGMFLG       ;INITIALIZE MEMORY MANAGEMENT ERROR FLAG
1436 020526  012767  000340  160536    MOV     #340,TBITPS     ;INITIALIZE LOG THAT HOLDS T-BIT PSW
```

```
1438 020534  005067  157032          CLR     MMR0            ;BE SURE MEM. MGMT IS OFF TO START WITH
1439 020540  005067  151752          CLR     MMR3            ;MAKE SURE ALL MAPPING IS OFF
```

```
1441 020544  005067  157216                CLR     CPUERR          ;MAKE SURE CPU ERROR REG. IS CLEAR
1442 020550  052767  000200  161734        BIS     #BIT7,$KT11     ;SET M.M. FLAG FOR SIZING ROUTINE
1443 020556  004767  161672                JSR     PC,$SIZE        ;RUN SIZING ROUTINE
1444 020562  005067  157200                CLR     CPUERR          ;CLEAR CPU ERROR REG. AFTER SIZING
1445
```

```
1447
1448
1449                                    ;/.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\
1450                                    .SBTTL  GROUP 1          ADDRESS AND DATA PATHS TESTS
1451                                    ;/.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\
1452
1453
1460                                    ;;*****************************************************************************
                                        ;*TEST 1          PSW PRIORITY BIT TEST
                                        ;*
                                        ;*      THIS TEST READS AND WRITES THE PROCESSOR STATUS WORD <7:5> 'PRIORITY BITS''
                                        ;*      TO SEE THAT SOME OF THE BASIC 'DATA PATH'' LOGIC IS WORKING.
                                        ;*
                                        ;;*****************************************************************************
     020566  000004                     TST1:   SCOPE
1461 020570  012767  020600  160312     1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
1462 020576  005000                             CLR     R0              ;INITIALIZE R0 WITH PRIORITY=0 DATA
1463 020600  005001                     2$:     CLR     R1              ;PREPARE R1 TO ACCEPT DATA READ
1464 020602  010037  177776                     MOV     R0,@#PSW        ;WRITE PRIORITY BITS IN THE PSW
1465 020606  013701  177776                     MOV     @#PSW,R1        ;READ BACK THE LOW BYTE OF PSW
1466 020612  042701  177437                     BIC     #177437,R1      ;MASK OFF EVERYTHING EXCEPT PRIORITY BITS
1467 020616  020001                             CMP     R0,R1           ;WAS CORRECT PRIORITY SET IN THE PSW?
1468 020620  001401                             BEQ     3$              ;BRANCH IF YES
1469 020622  104003                             ERROR   +3              ;PRIORITY BITS SET WRONG IN PSW
1470                                                                     ;FOR TIGHTER SCOPE LOOP
1471                                                                     ;REPLACE ERROR CALL WITH
1472                                                                     ;'BR 2$'' = 000770
1473 020624  062700  000040             3$:     ADD     #40,R0          ;CHANGE DATA TO NEXT PRIORITY
1474 020630  022700  000400                     CMP     #400,R0         ;HAVE PRIORITIES 0-7 ALL BEEN CHECKED?
1475 020634  001361                             BNE     2$              ;BRANCH IF NO
1476 020636  012767  020570  160244             MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
1477
1483                                    ;;*****************************************************************************
                                        ;*TEST 2          PSW MODE BIT TEST
                                        ;*      THIS TEST READS AND WRITES THE PROCESSOR STATUS WORD <15:12> 'MODE BITS''
                                        ;*      TO FURTHER CHECK THE BASIC CPU DATA PATHS
                                        ;*
                                        ;;*****************************************************************************
     020644  000004                     TST2:   SCOPE
1484 020646  012767  020656  160234     1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
1485 020654  005000                             CLR     R0              ;INITIALIZE R0 WITH MODE BITS = 0000
1486 020656  005067  157114             2$:     CLR     PSW             ;INITIALIZE PSW
1487 020662  050067  157110                     BIS     R0,PSW          ;BIT SET THE PSW MODE BITS WITH R0
1488 020666  016701  157104                     MOV     PSW,R1          ;READ BACK THE CONTENTS OF THE PSW
1489 020672  042701  007777                     BIC     #007777,R1      ;MASK OFF EVERYTHING EXCEPT THE MODE BITS
1490 020676  020001                             CMP     R0,R1           ;WERE THE MODE BITS SET CORRECTLY?
1491 020700  001403                             BEQ     3$              ;BRANCH IF YES
1492 020702  005067  157070                     CLR     PSW             ;CLEAR PSW FOR ERROR REPORT
1493 020706  104004                             ERROR   +4              ;MODE BITS SET WRONG IN PSW
1494                                                                     ;FOR TIGHTER SCOPE LOOP
1495                                                                     ;REPLACE ERROR CALL WITH
1496                                                                     ;'BR 2$'' = 000763
1497 020710  062700  010000             3$:     ADD     #10000,R0       ;CHANGE MODE BIT DATA
1498 020714  001360                             BNE     2$              ;BRANCH IF STILL MORE COMBINATIONS
1499 020716  012767  020646  160164             MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
1500 020724  005067  157046                     CLR     PSW             ;RESET PSW BEFORE LEAVING
1501
```

```
1509                                    ;;*****************************************************************
                                        ;*TEST 3        BYTE ADDRESSING TEST FOR PSW
                                        ;*
                                        ;*      THIS TEST WRITES THE HIGH AND LOW BYTES OF THE PROCESSOR STATUS WORD
                                        ;*      AND READS THEM BACK TO BE SURE THEY CAN BE WRITTEN INDEPENDENTLY.
                                        ;*      THIS CHECKS THE PSW PORTION OF THE ADDRESS DETECTION LOGIC.
                                        ;*
                                        ;*****************************************************************
     020730  000004                     TST3:   SCOPE
1510 020732  012767  020740  160150     1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
1511 020740  005067  157032             2$:     CLR     PSW             ;CLEAR THE PSW
1512 020744  012700  000360                     MOV     #360,R0         ;PUT THE HIGH BYTE DATA INTO R0
1513 020750  110067  157023                     MOVB    R0,PSW+1        ;WRITE THE HIGH BYTE OF THE PSW
1514 020754  016701  157016                     MOV     PSW,R1          ;READ BACK THE ENTIRE PSW
1515 020760  042701  007437                     BIC     #007437,R1      ;MASK OFF THE T & CC BITS
1516 020764  000300                             SWAB    R0              ;GET DATA WRITTEN IN HIGH BYTE OF R0
1517 020766  020001                             CMP     R0,R1           ;WAS THE PSW WRITTEN TO CORRECTLY
1518 020770  001403                             BEQ     3$              ;BRANCH IF YES
1519 020772  005067  157000                     CLR     PSW             ;CLEAR PSW FOR ERROR REPORT
1520 020776  104005                             ERROR   +5              ;LOW BYTE EFFECTED BY WRITE TO HIGH BYTE OF PSW
1521                                                                    ;FOR TIGHTER SCOPE LOOP
1522                                                                    ;REPLACE ERROR CALL WITH
1523                                                                    ;'BR 2$'' = 000760
1524 021000  012767  021006  160102     3$:     MOV     #4$,$LPERR      ;SET LOOP ON ERROR POINTER TO 4$
1525 021006  005067  156764             4$:     CLR     PSW             ;CLEAR THE PSW
1526 021012  012700  000340                     MOV     #340,R0         ;PUT THE LOW BYTE DATA INTO R0
1527 021016  110067  156754                     MOVB    R0,PSW          ;WRITE THE LOW BYTE OF THE PSW
1528 021022  016701  156750                     MOV     PSW,R1          ;READ BACK THE ENTIRE PSW
1529 021026  042701  007437                     BIC     #007437,R1      ;MASK OFF THE T&CC BITS
1530 021032  020001                             CMP     R0,R1           ;WAS PSW WRITTEN TO CORRECTLY
1531 021034  001403                             BEQ     5$              ;BRANCH IF YES
1532 021036  005067  156734                     CLR     PSW             ;CLEAR PSW FOR ERROR REPORT
1533 021042  104005                             ERROR   +5              ;HIGH BYTE EFFECTED BY WRITE TO LOW BYTE OF PSW
1534                                                                    ;FOR TIGHTER SCOPE LOOP
1535                                                                    ;REPLACE ERROR CALL WITH
1536                                                                    ;'BR 2$'' = 000736
1537 021044  012767  020732  160036     5$:     MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
```

```
1550                                    ;;*****************************************************************
                                        ;*TEST 4        TEST AND SETUP OF STACK POINTERS
                                        ;*
                                        ;*      THIS TEST SETS THE USER AND KERNEL STACK POINTERS FOR THE
                                        ;*      REST OF THE PROGRAM AND MAKES SURE THEY ARE INDEPENDENT OF
                                        ;*      EACH OTHER.  KERNEL R6 IS SET TO 1100,SUPERVISOR R6 IS SET TO 700,
                                        ;*      USER R6 IS SET TO 600, THEN KERNEL R6 IS READ TO BE SURE
                                        ;*      IT'S STILL 1100.  THE SECOND PART OF THE TEST CHECKS TO SEE
                                        ;*      THAT THE ILLEGAL MODE('10') STACK POINTER IS MAPPED TO THE
                                        ;*      USER STACK POINTER, WITH MEMORY MANAGEMENT OFF.
                                        ;*
                                        ;;*****************************************************************
     021052  000004                     TST4:   SCOPE
1551 021054  005037  177572                     CLR     @#MMR0          ;MAKE SURE M.M. IS OFF
1552 021060  005067  156712                     CLR     PSW             ;GO TO KERNEL MODE
1553 021064  012706  001100                     MOV     #KERSTK,KSP     ;SET KERNEL STACK POINTER TO 1100
1554 021070  012767  040000  156700             MOV     #40000, PSW     ;GO TO SUPERVISOR MODE
1555 021076  012706  000700                     MOV     #SUPSTK,SSP     ;SET SUPERVISOR STACK POINTER TO 700
1556 021102  012767  140000  156666             MOV     #140000,PSW     ;GO TO USER MODE
1557 021110  012706  000600                     MOV     #USESTK,USP     ;SET USER STACK POINTER TO 600
1558 021114  005067  156656                     CLR     PSW             ;BACK TO KERNEL MODE
1559 021120  022706  001100                     CMP     #KERSTK,KSP     ;IS KERNEL R6 STILL 1100?
1560 021124  000404                             BR      1$              ;BRANCH TO NEXT PART OF TEST
1561 021126  012700  001100                     MOV     #KERSTK,R0      ;SAVE DATA WRITTEN FOR ERROR REPORT
1562 021132  010601                             MOV     KSP,R1          ;SAVE DATA READ AFTER USER R6 WAS WRITTEN
1563 021134  104006                             ERROR   +6              ;KERNEL R6 CHANGED BY WRITING USER R6
1564                                                                     ;FOR TIGHTER SCOPE LOOP
1565                                                                     ;REPLACE ERROR CALL WITH
1566                                                                     ;000756
1567 021136  012767  021136  157744  1$:        MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
1568 021144  005067  156626                     CLR     PSW             ;GO TO KERNAL MODE
1569 021150  012746  177777                     MOV     #-1,-(KSP)      ;PUSH A -1 ONTO STACK
1570 021154  012767  040000  156614             MOV     #40000,PSW      ;GO TO SUPERVISOR MODE
1571 021162  012746  000001                     MOV     #1,-(SSP)       ;PUSH A 1 ONTO THE STACK
1572 021166  012767  140000  156602             MOV     #140000,PSW     ;GO TO USER MODE
1573 021174  005046                             CLR     -(USP)          ;PUSH A ZERO ONTO THE STACK
1574 021176  012767  100000  156572             MOV     #100000,PSW     ;PUT ILLEGAL MODE IN PSW
1575 021204  011600                             MOV     (SP),R0         ;PUT TOP OF STACK INTO R0
1576 021206  001401                             BEQ     TST5            ;;WE'RE OK-GO TO NEXT TEST
1577 021210  104040                             ERROR   +40             ;ILLEGAL MODE NOT MAPPED TO USER MODE
```

```
                        ;;*****************************************************************
                        ;*
                        ;*      THE NEXT SEVEN (7) TESTS WILL TRY TO ADDRESS ALL OF THE
                        ;*      MEMORY MANAGEMENT REGISTERS (SR0->SR3; I&D SPACE KERNEL,
                        ;*      SUPERVISOR & USER PAR/PDR'S).
                        ;*      EVERY TIME A REGISTER TIMES OUT ITS ADDRESS WILL BE REPORTED.
                        ;*      AT THE END OF EACH TEST A SUMMARY OF THE ADDRESSES THAT TIMED
                        ;*      OUT DURING THAT TEST IS GIVEN.  THE RESULTS OF ''AND-ING'' AND ''OR-ING''
                        ;*      THEIR ADDRESSES IS GIVEN TO SHOW WHICH ADDRESS LINES MAY BE
                        ;*      STUCK AT 0 OR 1.  THE PAR/PDR ADDRESS AND KT MUX'S ARE THE
                        ;*      THINGS BEING CHECKED.
                        ;*
                        ;;*****************************************************************


                        ;;*****************************************************************
                        ;*TEST 5        SR0,SR1,SR2,SR3 TIMEOUT TEST
                        ;*
                        ;*      THIS TEST ADDRESSES THE MEMORY MANAGEMENT STATUS REGISTERS
                        ;*      0,1,2, AND 3. DATA WILL BE WRITTEN OR READ FROM THESE REGISTERS
                        ;*      IN LATER TESTS, THIS TEST JUST CHECKS FOR A RESPONSE.
                        ;*
                        ;;*****************************************************************
021212  000004          TST5:   SCOPE

021214  005067  156556          CLR     PSW             ;MAKE SURE KERNAL MODE IS SELECTED
021220  012767  021262  157662  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
021226  012737  021326  000004          MOV     #6$,@#4         ;SET TIMEOUT VECTOR TO 6$
021234  012700  177572                  MOV     #SR0,R0         ;LOAD R0 WITH ADDRESS OF FIRST REG.
021240  012701  000003                  MOV     #3,R1           ;LOAD R1 WITH THE LOOP COUNT
021244  012767  177777  160046          MOV     #-1,ADRAND      ;INITIALIZE ''AND'' OF ADDRS. LOC.
021252  005067  160040                  CLR     ADDROR          ;INITIALIZE ''OR'' OF ADDRS. LOC.
021256  005067  160012                  CLR     TONUM           ;INITIALIZE ''TIMEOUTS'' COUNTER
021262  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A STATUS REGISTER
                                                                ;IF IT TIMES OUT GO TO 6$
021264  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT ADDRESS IN R0
021270  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
021272  012700  172516                  MOV     #SR3,R0         ;LOAD R0 WITH THE ADDRESS OF SR3
021276  005710                          TST     (R0)            ;TRY ADDRESSING SR3
021300  012767  021220  157602  4$:     MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
021306  005767  157762                  TST     TONUM           ;DID ANY OF THE STATUS REG.S TIMEOUT?
021312  001401                          BEQ     5$              ;BRANCH IF NO
021314  104010                          ERROR   +10             ;SUMMARY OF STATUS REG. TIMEOUTS
021316  012737  003024  000004  5$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
021324  000417                          BR      TST6            ;;GO TO NEXT TEST

021326  062706  000004          6$:     ADD     #4,KSP          ;CLEAN UP THE STACK
021332  104007                          ERROR   +7              ;ONE OF THE STATUS REGS. TIMED OUT
                                                                ;FOR TIGHTER SCOPE LOOP
                                                                ;REPLACE ERROR CALL WITH
                                                                ;''BR 2$'' = 000756
021334  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
021336  050267  157754                  BIS     R2,ADDROR       ;''OR'' IT WITH OTHER ADDRS. THAT TIMED OUT
021342  005102                          COM     R2              ;''AND'' IT WITH OTHER ADDRS. THAT TIMED OUT
021344  040267  157750                  BIC     R2,ADRAND
021350  005267  157720                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
021354  032700  172516                  BIT     #SR3,R0         ;TEST FOR LAST REGISTER
```

```
                                                BNE     4$              ;SR3 IS LAST;GO TO FINAL ERROR REPORT
                                                BR      3$              ;BRANCH BACK TO TEST THE NEXT ADDR.

                                ;;**************************************************************************
                                ;*TEST 6         KERNEL I&D SPACE PAR'S TIMEOUT TEST
                                ;*      THIS TEST ADDRESSES THE SIXTEEN (16) KERNEL PAGE ADDRESS
                                ;*      REGISTERS (KIPAR0-KIPAR7 AND KDPAR0-KDPAR7)
                                ;*      AND CHECKS THAT SOMETHING RESPONDS TO THEIR ADDRESSES.
                                ;;**************************************************************************
021364  000004                  TST6:   SCOPE
021366  012767  021430  157514  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
021374  012737  021466  000004          MOV     #5$,@#4         ;SET TIMEOUT VECTOR TO 5$
021402  012700  172340                  MOV     #KIPAR0,R0      ;LOAD R0 WITH ADDRESS OF FIRST REG
021406  012701  000020                  MOV     #20,R1          ;LOAD R1 WITH LOOP COUNT (16)
021412  012767  177777  157700          MOV     #-1,ADRAND      ;INITIALIZE "AND" OF ADDR. LOC
021420  005067  157672                  CLR     ADDROR          ;INITIALIZE "OR" OF ADR. LOC.
021424  005067  157644                  CLR     TONUM           ;INITIALIZE "TIMEOUTS" COUNTER
021430  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A REGISTER
                                                                ;IF IT TIMES OUT, WILL GO TO 5$
021432  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT REGISTER ADDRESS IN R0
021436  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
021440  012767  021366  157442          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
021446  005767  157622                  TST     TONUM           ;DID ANY OF THE REGISTES TIME OUT?
021452  001401                          BEQ     4$              ;BRANCH IF NO
021454  104010                          ERROR   +10             ;SUMMARY OF REGISTER TIMEOUTS
021456  012737  003024  000004  4$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
021464  000414                          BR      TST7            ;;BRANCH TO NEXT TEST
021466  062706  000004          5$:     ADD     #4,KSP          ;CLEAN UP THE STACK
021472  104007                          ERROR   +7              ;ONE OF THE REGISTER TIMED OUT
                                                                ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                ;CALL WITH "BR 2$" = 000756
021474  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
021476  050267  157614                  BIS     R2,ADDROR       ;"OR" IT WITH OTHER ADDRS. THAT TIMED OUT
021502  005102                          COM     R2              ;"AND" IT WITH OTHER ADDRS. THAT TIMED OUT
021504  040267  157610                  BIC     R2,ADRAND
021510  005267  157560                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
021514  000746                          BR      3$              ;BRANCH BACK TO TEST THE NEXT REGISTER

                                ;;**************************************************************************
                                ;*TEST 7         KERNEL I&D SPACE PDR'S TIMEOUT TEST
                                ;*      THIS TEST ADDRESSES THE SIXTEEN (16) KERNEL PAGE DESCRIPTOR
                                ;*      REGISTERS (KIPAR0-KIPAR7 AND KDPAR0-KDPAR7)
                                ;*      AND CHECKS THAT SOMETHING RESPONDS TO THEIR ADDRESSES.
                                ;;**************************************************************************
021516  000004                  TST7:   SCOPE
021520  012767  021562  157362  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
021526  012737  021620  000004          MOV     #5$,@#4         ;SET TIMEOUT VECTOR TO 5$
021534  012700  172300                  MOV     #KIPDR0,R0      ;LOAD R0 WITH ADDRESS OF FIRST REG
021540  012701  000020                  MOV     #20,R1          ;LOAD R1 WITH LOOP COUNT (16)
021544  012767  177777  157546          MOV     #-1,ADRAND      ;INITIALIZE "AND" OF ADDR. LOC
021552  005067  157540                  CLR     ADDROR          ;INITIALIZE "OR" OF ADR. LOC.
021556  005067  157512                  CLR     TONUM           ;INITIALIZE "TIMEOUTS" COUNTER
021562  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A REGISTER
                                                                ;IF IT TIMES OUT, WILL GO TO 5$
021564  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT REGISTER ADDRESS IN R0
021570  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
021572  012767  021520  157310          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
```

```
        021600  005767  157470                  TST     TONUM           ;DID ANY OF THE REGISTES TIME OUT?
        021604  001401                          BEQ     4$              ;BRANCH IF NO
        021606  104010                          ERROR   +10             ;SUMMARY OF REGISTER TIMEOUTS
        021610  012737  003024  000004  4$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
        021616  000414                          BR      TST10           ;;BRANCH TO NEXT TEST
        021620  062706  000004          5$:     ADD     #4,KSP          ;CLEAN UP THE STACK
        021624  104007                          ERROR   +7              ;ONE OF THE REGISTER TIMED OUT
                                                                        ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                        ;CALL WITH 'BR 2$'' = 000756
        021626  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
        021630  050267  157462                  BIS     R2,ADDROR       ;''OR'' IT WITH OTHER ADDRS. THAT TIMED OUT
        021634  005102                          COM     R2              ;''AND'' IT WITH OTHER ADDRS. THAT TIMED OUT
        021636  040267  157456                  BIC     R2,ADRAND
        021642  005267  157426                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
        021646  000746                          BR      3$              ;BRANCH BACK TO TEST THE NEXT REGISTER
1649
1653                                    ;;**************************************************************************
                                        ;*TEST 10       SUPERVISOR I&D SPACE PAR'S TIMEOUT TEST
                                        ;*      THIS TEST ADDRESSES THE SIXTEEN (16) SUPERVISOR PAGE ADDRESS
                                        ;*      REGISTERS (SIPAR0-SIPAR7 AND SDPAR0-SDPAR7)
                                        ;*      AND CHECKS THAT SOMETHING RESPONDS TO THEIR ADDRESSES.
                                        ;;**************************************************************************
        021650  000004                  TST10:  SCOPE
1654    021652  012767  021714  157230  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
        021660  012737  021752  000004          MOV     #5$,@#4         ;SET TIMEOUT VECTOR TO 5$
        021666  012700  172240                  MOV     #SIPAR0,R0      ;LOAD R0 WITH ADDRESS OF FIRST REG
        021672  012701  000020                  MOV     #20,R1          ;LOAD R1 WITH LOOP COUNT (16)
        021676  012767  177777  157414          MOV     #-1,ADRAND      ;INITIALIZE ''AND'' OF ADDR. LOC
        021704  005067  157406                  CLR     ADDROR          ;INITIALIZE ''OR'' OF ADR. LOC.
        021710  005067  157360                  CLR     TONUM           ;INITIALIZE ''TIMEOUTS'' COUNTER
        021714  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A REGISTER
                                                                        ;IF IT TIMES OUT, WILL GO TO 5$
        021716  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT REGISTER ADDRESS IN R0
        021722  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
        021724  012767  021652  157156          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
        021732  005767  157336                  TST     TONUM           ;DID ANY OF THE REGISTES TIME OUT?
        021736  001401                          BEQ     4$              ;BRANCH IF NO
        021740  104010                          ERROR   +10             ;SUMMARY OF REGISTER TIMEOUTS
        021742  012737  003024  000004  4$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
        021750  000414                          BR      TST11           ;;BRANCH TO NEXT TEST
        021752  062706  000004          5$:     ADD     #4,KSP          ;CLEAN UP THE STACK
        021756  104007                          ERROR   +7              ;ONE OF THE REGISTER TIMED OUT
                                                                        ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                        ;CALL WITH 'BR 2$'' = 000756
        021760  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
        021762  050267  157330                  BIS     R2,ADDROR       ;''OR'' IT WITH OTHER ADDRS. THAT TIMED OUT
        021766  005102                          COM     R2              ;''AND'' IT WITH OTHER ADDRS. THAT TIMED OUT
        021770  040267  157324                  BIC     R2,ADRAND
        021774  005267  157274                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
        022000  000746                          BR      3$              ;BRANCH BACK TO TEST THE NEXT REGISTER
1655
1659                                    ;;**************************************************************************
                                        ;*TEST 11       SUPERVISOR I&D SPACE PDR'S TIMEOUT TEST
                                        ;*      THIS TEST ADDRESSES THE SIXTEEN (16) SUPERVISOR PAGE DESCRIPTOR
                                        ;*      REGISTERS (SIPAR0-SIPAR7 AND SDPAR0-SDPAR7)
                                        ;*      AND CHECKS THAT SOMETHING RESPONDS TO THEIR ADDRESSES.
                                        ;;**************************************************************************
```

```
                022002  000004                  TST11:  SCOPE
1660            022004  012767  022046  157076  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
                022012  012737  022104  000004          MOV     #5$,@#4         ;SET TIMEOUT VECTOR TO 5$
                022020  012700  172200                  MOV     #SIPDR0,R0      ;LOAD R0 WITH ADDRESS OF FIRST REG
                022024  012701  000020                  MOV     #20,R1          ;LOAD R1 WITH LOOP COUNT (16)
                022030  012767  177777  157262          MOV     #-1,ADRAND      ;INITIALIZE ''AND'' OF ADDR. LOC
                022036  005067  157254                  CLR     ADDROR          ;INITIALIZE 'OR'' OF ADR. LOC.
                022042  005067  157226                  CLR     TONUM           ;INITIALIZE 'TIMEOUTS'' COUNTER
                022046  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A REGISTER
                                                                                ;IF IT TIMES OUT, WILL GO TO 5$
                022050  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT REGISTER ADDRESS IN R0
                022054  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
                022056  012767  022004  157024          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
                022064  005767  157204                  TST     TONUM           ;DID ANY OF THE REGISTES TIME OUT?
                022070  001401                          BEQ     4$              ;BRANCH IF NO
                022072  104010                          ERROR   +10             ;SUMMARY OF REGISTER TIMEOUTS
                022074  012737  003024  000004  4$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
                022102  000414                          BR      TST12           ;;BRANCH TO NEXT TEST
                022104  062706  000004          5$:     ADD     #4,KSP          ;CLEAN UP THE STACK
                022110  104007                          ERROR   +7              ;ONE OF THE REGISTER TIMED OUT
                                                                                ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                                ;CALL WITH 'BR 2$'' = 000756
                022112  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
                022114  050267  157176                  BIS     R2,ADDROR       ;''OR'' IT WITH OTHER ADDRS. THAT TIMED OUT
                022120  005102                          COM     R2              ;''AND'' IT WITH OTHER ADDRS. THAT TIMED OUT
                022122  040267  157172                  BIC     R2,ADRAND
                022126  005267  157142                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
                022132  000746                          BR      3$              ;BRANCH BACK TO TEST THE NEXT REGISTER
1661
1665                                            ;;*****************************************************************
                                                ;*TEST 12       USER I&D SPACE PAR'S TIMEOUT TEST
                                                ;*      THIS TEST ADDRESSES THE SIXTEEN (16) USER PAGE ADDRESS
                                                ;*      REGISTERS (UIPAR0-UIPAR7 AND UDPAR0-UDPAR7)
                                                ;*      AND CHECKS THAT SOMETHING RESPONDS TO THEIR ADDRESSES.
                                                ;;*****************************************************************
                022134  000004                  TST12:  SCOPE
1666            022136  012767  022200  156744  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
                022144  012737  022236  000004          MOV     #5$,@#4         ;SET TIMEOUT VECTOR TO 5$
                022152  012700  177640                  MOV     #UIPAR0,R0      ;LOAD R0 WITH ADDRESS OF FIRST REG
                022156  012701  000020                  MOV     #20,R1          ;LOAD R1 WITH LOOP COUNT (16)
                022162  012767  177777  157130          MOV     #-1,ADRAND      ;INITIALIZE ''AND'' OF ADDR. LOC
                022170  005067  157122                  CLR     ADDROR          ;INITIALIZE 'OR'' OF ADR. LOC.
                022174  005067  157074                  CLR     TONUM           ;INITIALIZE 'TIMEOUTS'' COUNTER
                022200  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A REGISTER
                                                                                ;IF IT TIMES OUT, WILL GO TO 5$
                022202  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT REGISTER ADDRESS IN R0
                022206  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
                022210  012767  022136  156672          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
                022216  005767  157052                  TST     TONUM           ;DID ANY OF THE REGISTES TIME OUT?
                022222  001401                          BEQ     4$              ;BRANCH IF NO
                022224  104010                          ERROR   +10             ;SUMMARY OF REGISTER TIMEOUTS
                022226  012737  003024  000004  4$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
                022234  000414                          BR      TST13           ;;BRANCH TO NEXT TEST
                022236  062706  000004          5$:     ADD     #4,KSP          ;CLEAN UP THE STACK
                022242  104007                          ERROR   +7              ;ONE OF THE REGISTER TIMED OUT
                                                                                ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                                ;CALL WITH 'BR 2$'' = 000756
```

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        022244  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
        022246  050267  157044                  BIS     R2,ADDROR       ;''OR'' IT WITH OTHER ADDRS. THAT TIMED OUT
        022252  005102                          COM     R2              ;''AND'' IT WITH OTHER ADDRS. THAT TIMED OUT
        022254  040267  157040                  BIC     R2,ADRAND
        022260  005267  157010                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
        022264  000746                          BR      3$              ;BRANCH BACK TO TEST THE NEXT REGISTER
  1667
  1671                                  ;;*****************************************************************
                                        ;*TEST 13       USER I&D SPACE PDR'S TIMEOUT TEST
                                        ;*      THIS TEST ADDRESSES THE SIXTEEN (16) USER PAGE DESCRIPTOR
                                        ;*      REGISTERS (UIPAR0-UIPAR7 AND UDPAR0-UDPAR7)
                                        ;*      AND CHECKS THAT SOMETHING RESPONDS TO THEIR ADDRESSES.
                                        ;;*****************************************************************
        022266  000004                  TST13:  SCOPE
  1672  022270  012767  022332  156612  1$:     MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
        022276  012737  022370  000004          MOV     #5$,@#4         ;SET TIMEOUT VECTOR TO 5$
        022304  012700  177600                  MOV     #UIPDR0,R0      ;LOAD R0 WITH ADDRESS OF FIRST REG
        022310  012701  000020                  MOV     #20,R1          ;LOAD R1 WITH LOOP COUNT (16)
        022314  012767  177777  156776          MOV     #-1,ADRAND      ;INITIALIZE ''AND'' OF ADDR. LOC
        022322  005067  156770                  CLR     ADDROR          ;INITIALIZE ''OR'' OF ADR. LOC.
        022326  005067  156742                  CLR     TONUM           ;INITIALIZE ''TIMEOUTS'' COUNTER
        022332  005710                  2$:     TST     (R0)            ;TRY ADDRESSING A REGISTER
                                                                        ;IF IT TIMES OUT, WILL GO TO 5$
        022334  062700  000002          3$:     ADD     #2,R0           ;PUT NEXT REGISTER ADDRESS IN R0
        022340  077104                          SOB     R1,2$           ;LOOP BACK TO 2$ UNTIL ALL TESTED
        022342  012767  022270  156540          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
        022350  005767  156720                  TST     TONUM           ;DID ANY OF THE REGISTES TIME OUT?
        022354  001401                          BEQ     4$              ;BRANCH IF NO
        022356  104010                          ERROR   +10             ;SUMMARY OF REGISTER TIMEOUTS
        022360  012737  003024  000004  4$:     MOV     #TIMERR,@#4     ;RESTORE NORMAL CPU TRAP ROUTINE ADDRESS
        022366  000414                          BR      TST14           ;;BRANCH TO NEXT TEST
        022370  062706  000004          5$:     ADD     #4,KSP          ;CLEAN UP THE STACK
        022374  104007                          ERROR   +7              ;ONE OF THE REGISTER TIMED OUT
                                                                        ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                        ;CALL WITH 'BR 2$'' = 000756
        022376  010002                          MOV     R0,R2           ;LOAD THE ADDRESS THAT TIMED OUT INTO R2
        022400  050267  156712                  BIS     R2,ADDROR       ;''OR'' IT WITH OTHER ADDRS. THAT TIMED OUT
        022404  005102                          COM     R2              ;''AND'' IT WITH OTHER ADDRS. THAT TIMED OUT
        022406  040267  156706                  BIC     R2,ADRAND
        022412  005267  156656                  INC     TONUM           ;INCREMENT THE TIMEOUT COUNTER
        022416  000746                          BR      3$              ;BRANCH BACK TO TEST THE NEXT REGISTER
  1673
  1686                                  ;;*****************************************************************
                                        ;*TEST 14       MMR0(15:13) BIT TEST & MMR2 TEST
                                        ;*
                                        ;*      THIS TEST CHECKS BITS <15:13> OF MEMORY MANAGEMENT
                                        ;*      REGISTER 0 TO SEE THAT EACH CAN BE SET AND CLEARED
                                        ;*      AND THAT A ''RESET'' WILL CLEAR ALL OF THEM.  A TEST
                                        ;*      OF THESE THREE ERROR BITS CHECKS PART OF SR0, THE
                                        ;*      SR0 MUX AND THE KTMUX.  THE REST OF THE BITS IN
                                        ;*      SR0 WILL BE CHECKED LATER.
                                        ;*      ALSO CHECK THAT SR2 IS TRACKING WITH MEM. MGMT.
                                        ;*      OFF BUT LOCKS UP WHEN ANY OF SR0 ERROR BITS SET.
                                        ;*
                                        ;;*****************************************************************
        022420  000004                  TST14:  SCOPE
  1687
```

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1688 022422  012700  177572          1$:   MOV   #SR0,R0          ;LOAD ADDRESS OF SR0 INTO R0
1689 022426  012710  160000                MOV   #160000,(R0)     ;SET BITS <15:13> IN SR0 (ERROR BITS)
1690 022432  000005                        RESET                  ;ISSUE AND ''INIT'' SIGNAL
1691 022434  011001                        MOV   (R0),R1          ;READ SR0 INTO R1 TO SEE IF CLEAR
1692 022436  001404                        BEQ   2$               ;BRANCH IF SR0<15:13> CLEARED BY ''INIT''
1693 022440  104011                        ERROR +11              ;SR0<15:13> NOT CLEARED BY A 'RESET''
1694                                                              ;FOR TIGHTER SCOPE LOOP
1695                                                              ;REPLACE ERROR CALL WITH
1696                                                              ;''BR 1$'' = 000770
1697 022442  012767  022450  156440          MOV   #2$,$LPERR       ;SET LOOP ON ERROR POINTER TO 2$
1698 022450  016767  155122  156612  2$:     MOV   SR2,WASSR2       ;READ CONTENTS OF SR2
1699 022456  012701  022450                MOV   #2$,R1           ;LOAD EXPECTED CONTENTS INTO R1
1700 022462  020167  156602                CMP   R1,WASSR2        ;IS SR2 TRACKING?
1701 022466  001401                        BEQ   3$               ;BRANCH IF YES
1702 022470  104021                        ERROR +21              ;SR2 NOT ''TRACKING'' VIRTUAL ADDRESSES
1703                                                              ;FOR TIGHTER SCOPE LOOP
1704                                                              ;REPLACE ERROR CALL WITH
1705                                                              ;''BR 2$'' = 000767
1706 022472  012767  022510  156410  3$:     MOV   #4$,$LPERR       ;SET LOOP ON ERROR POINTER TO 4$
1707 022500  012701  100000                MOV   #BIT15,R1        ;PUT DATA TO BE WRITTEN IN R1
1708 022504  012703  000003                MOV   #3,R3            ;SETUP R3 AS A LOOP COUNTER
1709 022510  005010                  4$:   CLR   (R0)             ;CLEAR SR0
1710 022512  050110                  5$:   BIS   R1,(R0)          ;SET ONE OF THE ERROR BITS IN SR0
1711 022514  011002                        MOV   (R0),R2          ;READ SR0 INTO R2
1712 022516  020102                        CMP   R1,R2            ;DID RIGHT ERROR BIT GET SET?
1713 022520  001401                        BEQ   6$               ;BRANCH IF YES
1714 022522  104012                        ERROR +12              ;BITS WERE SET WRONG IN SR0
1715                                                              ;FOR TIGHTER SCOPE LOOP
1716                                                              ;REPLACE ERROR CALL WITH
1717                                                              ;''BR 4$'' = 000772
1718 022524  012704  022512          6$:     MOV   #5$,R4           ;LOAD EXPECTED CONTENTS OF SR2 IN R4
1719 022530  016767  155042  156532          MOV   SR2,WASSR2       ;READ SR2
1720 022536  020467  156526                CMP   R4,WASSR2        ;DID SR2 LOCK UP WHEN ERROR
1721                                                              ;BIT SET IN SR1?
1722 022542  001401                        BEQ   7$               ;BRANCH IF YES
1723 022544  104027                        ERROR +27              ;SR2 DID NOT LOCK UP
1724                                                              ;FOR TIGHTER SCOPE LOOP
1725                                                              ;REPLACE ERROR CALL WITH
1726                                                              ;''BR 4$'' = 000761
1727 022546  006001                  7$:   ROR   R1               ;CHANGE DATA TO CHECK NEXT ERROR BIT
1728 022550  077321                        SOB   R3,4$            ;LOOP BACK UNTIL <15:13> ALL TESTED
1729 022552  005010                        CLR   (R0)             ;CLEAR SR0 BEFORE LEAVING
1730 022554  012767  022422  156326        MOV   #1$,$LPERR       ;RESET LOOP ON ERROR POINTER TO 1$
1731
1741                                ;;*****************************************************************
                                    ;*TEST 15       SR0 & PSW DUAL ADDRESSING TEST
                                    ;*
                                    ;*      THIS TEST CHECKS MORE OF THE ADDRESS DETECTION LOGIC BY
                                    ;*      VERIFYING THAT STATUS REGISTER 0 IS NOT EFFECTED BY WRITING
                                    ;*      TO THE PSW AND THAT THE LOW BYTE OF STATUS REGISTER 0
                                    ;*      IS NOT EFFECTED BY WRITING TO ITS HIGH BYTE.  THIS IS TO
                                    ;*      SEE IF ADJACENT OUTPUTS ARE SHORTED ON THE ADDRESS DET. LOGIC.
                                    ;*
                                    ;;*****************************************************************
     022562  000004                 TST15:  SCOPE
1742
1743 022564  005067  155206          1$:   CLR   PSW              ;CLEAR THE PSW
```

```
 1744 022570  005067  154776                    CLR     SR0             ;CLEAR STATUS REGISTER 0
 1745 022574  012737  000340  177776            MOV     #340,@#PSW      ;SET PRIORITY 7 IN LOW BYTE OF PSW
 1746 022602  016700  154764                    MOV     SR0,R0          ;READ STATUS REGISTER 0
 1747 022606  001401                            BEQ     2$              ;BRANCH IF IT WAS STILL 0
 1748 022610  104013                            ERROR   +13             ;SR0 EFFECTED BY A WRITE TO THE PSW
 1749                                                                    ;FOR TIGHTER SCOPE LOOP
 1750                                                                    ;REPLACE ERROR CALL WITH
 1751                                                                    ;'BR 1$' = 000767
 1752 022612  005067  154754            2$:     CLR     SR0             ;BE SURE SR0 IS 0 BEFORE LEAVING
 1753 022616  005067  155154                    CLR     PSW             ;BE SURE PSW IS 0 BEFORE LEAVING
```

```
1767
1768                                    ;;*********************************************************************
                                        ;*TEST 16       BIT TEST OF MEMORY MANAGMENT REGISTER 1
                                        ;*THIS TEST WILL CAUSE BITS IN MMR1 TO BE LOCKED BY SETTING BITS <15:13>
                                        ;*IN MMR0.  THE REGISTER ONLY GETS CLOCKED ON AN INSTRUCTION THAT AUTO
                                        ;*INCREMENTS OR AUTO DECREMENTS A REGISTER.  THE LOWER BYTE IS ALWAYS CLOCKED
                                        ;*FIRST AND THE UPPER BYTE IS ONLY CLOCKED IF BOTH SOURCE AND DESTINATION
                                        ;*AUTO INCREMENT OR DECREMENT A REGISTER.
                                        ;*ALL COUNTS (+1,-1,+2,-2) THAT CAN BE GENERATED ARE CLOCKED INTO THE HIGH
                                        ;*AND LOW BYTES. ALL REGISTER NUMBERS ARE GENERATED, INCLUDING ALL THREE
                                        ;*R6'S, AND ALL THE BITS THAT HOLD THE REGISTER NUMBER IN BOTH BYTES
                                        ;*ARE TESTED;  HOWEVER, ALL REGISTER NUMBERS ARE CLOCKED INTO BOTH HIGH AND
                                        ;*LOW BYTES, BUT ENOUGH ARE USED TO TEST THE LOGIC.
                                        ;*********************************************************************
  022622  000004                        TST16:  SCOPE
1769 022624  012700  177574            20$:    MOV     #MMR1,R0        ;PUT ADDRESS OF MMR1 INTO R0
1770 022630  012704  020000                    MOV     #BIT13,R4       ;SET READ ONLY BIT IN R4
1771 022634  012767  022642  156246            MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
1772 022642  012737  100000  177572  11$:     MOV     #BIT15,@#MMR0   ;LOCK UP MMR1 LOW BYTE 027,HIGH BYTE 027
1773                                                                   ;WORD-013427
1774 022650  012703  013427                    MOV     #013427,R3      ;PUT EXPECTED DATA IN R3
1775 022654  011001                            MOV     (R0),R1         ;READ MMR1 INTO R1
1776 022656  020103                            CMP     R1,R3           ;SEE IF DATA MATCHES
1777 022660  001401                            BEQ     10$             ;BRANCH IF DATA MATCHES
1778 022662  104014                            ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1779 022664  012767  022672  156216  10$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
1780 022672  000005                    12$:    RESET                   ;ISSUE INIT
1781 022674  011001                            MOV     (R0),R1         ;SEE IF MMR1 IS CLEARED
1782 022676  001401                            BEQ     1$              ;BRANCH IF MMR1 IS ZERO
1783 022700  104011                            ERROR   +11             ;CAN'T CLEAR MMR1
1784 022702  012767  022710  156200  1$:      MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
1785 022710  012702  177572            13$:    MOV     #MMR0,R2        ;PUT ADDRESS OF MMR0 INTO R2
1786 022714  012722  040000                    MOV     #BIT14,(R2)+    ;LOCK UP MMR1-LOWER BYTE 027
1787                                                                   ;UPPER BYTE 022-WORD 011027
1788 022720  011001                            MOV     (R0),R1         ;READ MMR1
1789 022722  012703  011027                    MOV     #011027,R3      ;PUT EXPECTED DATA IN R3
1790 022726  020103                            CMP     R1,R3           ;SEE IF DATA MATCHES
1791 022730  001401                            BEQ     2$              ;BRANCH IF DATA MATCHES
1792 022732  104014                            ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1793 022734  005037  177572            2$:     CLR     @#MMR0          ;CLEAR MMR0
1794 022740  012767  022746  156142            MOV     #14$,$LPERR     ;SET LOOP ON ERROR POINTER TO 14$
1795 022746  012702  177574            14$:    MOV     #MMR0+2,R2      ;PUT ADDRESS OF MMR0 PLUS 2 IN R2
1796 022752  010442                            MOV     R4,-(R2)        ;LOCK UP MMR1-LOWER BYTE 000
1797                                                                   ;UPPER BYTE 362-WORD 171000
1798 022754  011001                            MOV     (R0),R1         ;READ MMR1
1799 022756  012703  171000                    MOV     #171000,R3      ;PUT EXPECTED DATA IN R3
1800 022762  020103                            CMP     R1,R3           ;SEE IF DATA MATCHES
1801 022764  001401                            BEQ     3$              ;BRANCH IF DATA MATCHES
1802 022766  104014                            ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1803 022770  005012                    3$:     CLR     (R2)            ;CLEAR MMR0
1804 022772  012767  023000  156110            MOV     #15$,$LPERR     ;SET LOOP ON ERROR POINTER TO 15$
1805 023000  012705  177573            15$:    MOV     #MMR0+1,R5      ;PUT ADDRESS OF MMR0'S UPPER BYTE IN R5
1806 023004  012701  001343                    MOV     #READON+1,R1    ;PUT ADDRESS OF READ ONLY BIT <13> IN R1
1807 023010  112125                            MOVB    (R1)+,(R5)+     ;LOCK UP MMR1-LOWER BYTE 011
1808                                                                   ;UPPER BYTE 015-WORD 006411
1809 023012  011001                            MOV     (R0),R1         ;READ MMR1
1810 023014  012703  006411                    MOV     #006411,R3      ;PUT EXPECTED DATA IN R3
```

```
1811 023020 020103                      CMP     R1,R3           ;SEE IF DATA MATCHES
1812 023022 001401                      BEQ     4$              ;BRANCH IF DATA MATCHES
1813 023024 104014                      ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1814 023026 005012              4$:     CLR     (R2)            ;CLEAR MMR0
1815 023030 012767 023036 156052        MOV     #16$,$LPERR     ;SET LOOP ON ERROR POINTER TO 16$
1816 023036 012701 177574       16$:    MOV     #MMR0+2,R1      ;PUT ADDRESS OF MMR0'S UPPER BYTE
1817                                                            ;PLUS 1 IN R1
1818 023042 012705 001344               MOV     #READON+2,R5    ;PUT ADDRESS OF READ ONLY BIT <13>
1819                                                            ;PLUS 2 IN R5
1820 023046 114541                      MOVB    -(R5),-(R1)     ;LOCK UP MMR1-LOWER BYTE 375
1821                                                            ;UPPER BYTE 371-WORD 174775
1822 023050 011001                      MOV     (R0),R1         ;READ MMR1
1823 023052 012703 174775               MOV     #174775,R3      ;PUT EXPECTED DATA IN R3
1824 023056 020103                      CMP     R1,R3           ;SEE IF DATA MATCHES
1825 023060 001401                      BEQ     5$              ;BRANCH IF DATA MATCHES
1826 023062 104014                      ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1827 023064 005012              5$:     CLR     (R2)            ;CLEAR MMR0
1828 023066 012767 023106 156014        MOV     #17$,$LPERR     ;SET LOOP ON ERROR POINTER TO 17$
1829 023074 012737 040000 177776        MOV     #40000,@#PSW    ;SET SUPERVISOR MODE
1830 023102 010637 001176               MOV     SSP,@#$TMP0     ;SAVE SUPERVISOR STACK POINTER
1831 023106 012706 177574       17$:    MOV     #MMR0+2,SSP     ;PUT ADDRESS OF MMR0+2 IN SSP
1832 023112 012746 040000               MOV     #40000,-(SSP)   ;LOCK UP MMR1-LOWER BYTE 027
1833                                                            ;UPPER BYTE 366-WORD 173027
1834 023116 011001                      MOV     (R0),R1         ;READ MMR1
1835 023120 012703 173027               MOV     #173027,R3      ;PUT EXPECTED DATA IN R3
1836 023124 020103                      CMP     R1,R3           ;SEE IF DATA MATCHES
1837 023126 001401                      BEQ     6$              ;BRANCH IF DATA MATCHES
1838 023130 104014                      ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1839 023132 016706 156040       6$:     MOV     $TMP0,SSP       ;RESTORE THE SUPERVISOR STACK POINTER
1840 023136 005012                      CLR     (R2)            ;CLEAR MMR0
1841 023140 012767 023160 155742        MOV     #18$,$LPERR     ;SET LOOP ON ERROR POINTER TO 18$
1842 023146 012737 140000 177776        MOV     #140000,@#PSW   ;SET USER MODE
1843 023154 010637 001176               MOV     USP,@#$TMP0     ;SAVE USER STACK POINTER
1844 023160 012706 177572       18$:    MOV     #MMR0,USP       ;PUT ADDRESS OF MMR0 IN USP
1845 023164 012726 100000               MOV     #100000,(USP)+  ;LOCK UP MMR1-LOWER BYTE 027
1846                                                            ;UPPER BYTE 026-WORD 013027
1847 023170 011001                      MOV     (R0),R1         ;READ MMR1
1848 023172 012703 013027               MOV     #013027,R3      ;PUT EXPECTED DATA IN R3
1849 023176 020103                      CMP     R1,R3           ;SEE IF DATA MATCHES
1850 023200 001401                      BEQ     7$              ;BRANCH IF DATA MATCHES
1851 023202 104014                      ERROR   +14             ;MMR1 DID NOT TRACK PROPERLY
1852 023204 016706 155766       7$:     MOV     $TMP0,USP       ;RESTORE THE USER STACK POINTER
1853 023210 005037 177776               CLR     @#PSW           ;GO BACK TO KERNAL MODE
1854 023214 005037 177572               CLR     @#MMR0          ;LET ALL MEM MGT REG'S TRACK
1855 023220 012767 022624 155662        MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
```

```
1864                                    ;;*************************************************************************
                                        ;*TEST 17       BIT TEST OF MEMORY MANAGEMENT REGISTER 3
                                        ;*      THIS TEST SETS AND CLEARS BITS <05:04> AND <02:00> OF MMR3. IT DOES
                                        ;*      NOT TEST THAT THE BITS FUNCTION PROPERLY SINCE THAT REQUIRES MORE
                                        ;*      LOGIC;  HOWEVER, IT TESTS THE REGISTER AND THE DATA PATH TO AND FROM
                                        ;*      THE REGISTER.  THE PROPER FUNCTIONING OF THESE BITS IS TESTED LATER
                                        ;*      IN SEVERAL TESTS.
                                        ;;*************************************************************************
     023226  000004                     TST17:  SCOPE
1865 023230  012700  172516             20$:    MOV     #MMR3,R0        ;PUT ADDRESS OF MMR3 IN R0
1866 023234  012702  000001                     MOV     #1,R2           ;SET BIT TO FLOAT THRU MMR3
1867 023240  005010                             CLR     (R0)            ;CLEAR MMR3
1868 023242  011001                             MOV     (R0),R1         ;READ MMR3 INTO R1
1869 023244  001401                             BEQ     5$              ;BRANCH IF ZERO
1870 023246  104011                             ERROR   +11             ;CAN'T CLEAR MMR3
1871 023250  012703  000006             5$:     MOV     #6,R3           ;SET UP LOOP COUNT
1872 023254  012767  023262  155626             MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
1873 023262  010210                     1$:     MOV     R2,(R0)         ;LOAD MMR3
1874 023264  011001                             MOV     (R0),R1         ;READ MMR3 INTO R1
1875 023266  020201                             CMP     R2,R1           ;DOES DATA MATCH PATTERN?
1876 023270  001401                             BEQ     2$              ;BRANCH IF IT MATCHES
1877 023272  104015                             ERROR   +15             ;MMR3 HAS WRONG DATA
1878 023274  006302                     2$:     ASL     R2              ;LEFT SHIFT DATA PATTERN
1879 023276  077307                             SOB     R3,1$           ;BRANCH BACK IF R3 NOT 0
1880 023300  012702  000077                     MOV     #77,R2          ;PUT DATA PATTERN IN R2
1881 023304  012767  023312  155576             MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
1882 023312  010210                     12$:    MOV     R2,(R0)         ;TRY TO SET ALL BITS IN MMR3
1883 023314  011001                             MOV     (R0),R1         ;READ MMR3 INTO R1
1884 023316  020201                             CMP     R2,R1           ;SEE IF ALL BITS GOT SET
1885 023320  001401                             BEQ     3$              ;BRANCH IF ALL WERE SET
1886 023322  104015                             ERROR   +15             ;MMR3 HAS WRONG DATA
1887 023324  012767  023332  155556     3$:     MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
1888 023332  000005                     13$:    RESET                   ;ISSUE AN INIT
1889 023334  011002                             MOV     (R0),R2         ;READ MMR3 INTO R2
1890 023336  001401                             BEQ     4$              ;BRANCH IF MMR3 CLEARED
1891 023340  104011                             ERROR   +11             ;CAN'T CLEAR MMR3
1892 023342  012767  023230  155540     4$:     MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
```

```
                        ;/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\
                        .SBTTL  GROUP 2          PAR AND PDR TESTS
                        ;/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\/.\
                        
                        
                        ;;*********************************************************************
                        ;*TEST 20       DUAL ADDRESS KERNAL PAR'S,ON LOADING
                        ;*
                        ;*THIS TEST FIRST CLEARS ALL THE KERNAL PAGE ADDRESS REGISTERS,
                        ;*AND CHECKS TO SEE THAT THEY EACH HOLD ZERO.  THEN, STARTING
                        ;*WITH I-SPACE ADDRESS REGISTER ZERO, ONE REGISTER AT A TIME IS
                        ;*LOADED WITH A NEGATIVE ONE.  ALL KERNAL ADDRESS REGISTERS ARE
                        ;*NOW READ TO SEE THAT ONLY THE ONE UNDER TEST IS NON-ZERO.
                        ;*INDIVIDUAL ERRORS ARE REPORTED AND A SUMMARY OF THEM IS GIVEN
                        ;*AT THE END OF THIS TEST.
                        ;;*********************************************************************
 023350  000004         TST20:  SCOPE
1913 023352  004767  156720  20$:    JSR     PC,CLEANUP      ;INITIALIZE THE ERROR LOCATIONS
 023356  012767  023404  155524       MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
 023364  012705  172340              MOV     #KIPAR0,R5      ;PUT ADDRESS OF FIRST PAR IN R5
 023370  004767  156664              JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
 023374  012700  172340              MOV     #KIPAR0,R0      ;PUT ADDRESS OF FIRST PAR IN R0
 023400  012701  000020              MOV     #20,R1          ;BRANCH COUNT IS 16 DECIMAL
 023404  011002              1$:     MOV     (R0),R2         ;READ PAR TO R2
 023406  001401                      BEQ     2$              ;BRANCH IF PAR IS 0
 023410  104030                      ERROR   +30             ;PAR NOT ZERO
 023412  062700  000002      2$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
 023416  077106                      SOB     R1,1$           ;BRANCH BACK TO 1$ 15 TIMES
                        ;NOW START DUAL ADDRESSING TEST BY LOADING -1 INTO ONE REGISTER AND
                        ;READING THE REST TO SEE ONLY THAT REGISTER IS NON ZERO. (ANY
                        ;DROPPED BITS WILL BE FOUND IN THE NEXT TEST).
 023420  012767  023432  155462       MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
 023426  012700  172340              MOV     #KIPAR0,R0      ;PUT ADDRESS OF FIRST PAR IN R0
 023432  012705  172340      3$:     MOV     #KIPAR0,R5      ;LOAD STARTING ADDRESS INTO R5
 023436  004767  156616              JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
 023442  012701  172376              MOV     #KDPAR7,R1      ;PUT KDPAR7 ADDRESS INTO R1
 023446  012710  177777              MOV     #-1,(R0)        ;LOAD REGISTER UNDER TEST
 023452  005067  155520      4$:     CLR     $TMP0           ;FLAG TO INDICATE THERE WAS A MATCH
 023456  011102                      MOV     (R1),R2         ;READ ALL REGISTERS
 023460  001406                      BEQ     6$              ;BRANCH IF REGISTER IS 0
 023462  020001                      CMP     R0,R1           ;IS THE ADDRESS OF NON-ZERO REGISTER THE SAME
                                                             ;AS THE REGISTER UNDER TEST?
 023464  001402                      BEQ     5$              ;BRANCH IF ADDRESSES MATCH
 023466  004767  156642              JSR     PC,DUALADR      ;LOG AND REPORT ERRORS
 023472  005267  155500      5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
 023476  162701  000002      6$:     SUB     #2,R1           ;POINT TO NEXT REGISTER
 023502  022701  172340              CMP     #KIPAR0,R1      ;SEE IF ALL REGISTERS HAVE BEEN READ
 023506  101761                      BLOS    4$              ;BRANCH IF MORE TO READ
 023510  062700  000002              ADD     #2,R0           ;NOW LOAD THE NEXT REGISTER
 023514  022700  172376              CMP     #KDPAR7,R0      ;SEE IF THERE ARE MORE REGISTERS TO TEST
 023520  103344                      BHIS    3$              ;BRANCH IF MORE REGISTERS TO TEST
 023522  012767  023352  155360       MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
 023530  005767  155566              TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
 023534  000404                      BR      TST21           ;;BRANCH TO NEXT TEST IF NO ERRORS
 023536  016767  155560  155444       MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR PAR OUT
 023544  104031                      ERROR   +31             ;;SUMMARY OF DUAL ADDRESS TEST
1917                    ;;*********************************************************************
```

```
                                        ;*TEST 21       DUAL ADDRESS SUPERVISOR PAR'S,ON LOADING
                                        ;*
                                        ;*THIS TEST FIRST CLEARS ALL THE SUPERVISOR PAGE ADDRESS REGISTERS,
                                        ;*AND CHECKS TO SEE THAT THEY EACH HOLD ZERO.  THEN, STARTING
                                        ;*WITH I-SPACE ADDRESS REGISTER ZERO, ONE REGISTER AT A TIME IS
                                        ;*LOADED WITH A NEGATIVE ONE.  ALL SUPERVISOR ADDRESS REGISTERS ARE
                                        ;*NOW READ TO SEE THAT ONLY THE ONE UNDER TEST IS NON-ZERO.
                                        ;*INDIVIDUAL ERRORS ARE REPORTED AND A SUMMARY OF THEM IS GIVEN
                                        ;*AT THE END OF THIS TEST.
                                        ;;*********************************************************************
 023546  000004                         TST21:  SCOPE
1918 023550  004767  156522             20$:    JSR     PC,CLEANUP      ;INITIALIZE THE ERROR LOCATIONS
     023554  012767  023602  155326             MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
     023562  012705  172240                     MOV     #SIPAR0,R5      ;PUT ADDRESS OF FIRST PAR IN R5
     023566  004767  156466                     JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
     023572  012700  172240                     MOV     #SIPAR0,R0      ;PUT ADDRESS OF FIRST PAR IN R0
     023576  012701  000020                     MOV     #20,R1          ;BRANCH COUNT IS 16 DECIMAL
     023602  011002                     1$:     MOV     (R0),R2         ;READ PAR TO R2
     023604  001401                             BEQ     2$              ;BRANCH IF PAR IS 0
     023606  104030                             ERROR   +30             ;PAR NOT ZERO
     023610  062700  000002             2$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
     023614  077106                             SOB     R1,1$           ;BRANCH BACK TO 1$ 15 TIMES
                                        ;NOW START DUAL ADDRESSING TEST BY LOADING -1 INTO ONE REGISTER AND
                                        ;READING THE REST TO SEE ONLY THAT REGISTER IS NON ZERO. (ANY
                                        ;DROPPED BITS WILL BE FOUND IN THE NEXT TEST).
     023616  012767  023630  155264             MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
     023624  012700  172240                     MOV     #SIPAR0,R0      ;PUT ADDRESS OF FIRST PAR IN R0
     023630  012705  172240             3$:     MOV     #SIPAR0,R5      ;LOAD STARTING ADDRESS INTO R5
     023634  004767  156420                     JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
     023640  012701  172276                     MOV     #SDPAR7,R1      ;PUT SDPAR7 ADDRESS INTO R1
     023644  012710  177777                     MOV     #-1,(R0)        ;LOAD REGISTER UNDER TEST
     023650  005067  155322             4$:     CLR     $TMP0           ;FLAG TO INDICATE THERE WAS A MATCH
     023654  011102                             MOV     (R1),R2         ;READ ALL REGISTERS
     023656  001406                             BEQ     6$              ;BRANCH IF REGISTER IS 0
     023660  020001                             CMP     R0,R1           ;IS THE ADDRESS OF NON-ZERO REGISTER THE SAME
                                                                         ;AS THE REGISTER UNDER TEST?
     023662  001402                             BEQ     5$              ;BRANCH IF ADDRESSES MATCH
     023664  004767  156444                     JSR     PC,DUALADR      ;LOG AND REPORT ERRORS
     023670  005267  155302             5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
     023674  162701  000002             6$:     SUB     #2,R1           ;POINT TO NEXT REGISTER
     023700  022701  172240                     CMP     #SIPAR0,R1      ;SEE IF ALL REGISTERS HAVE BEEN READ
     023704  101761                             BLOS    4$              ;BRANCH IF MORE TO READ
     023706  062700  000002                     ADD     #2,R0           ;NOW LOAD THE NEXT REGISTER
     023712  022700  172276                     CMP     #SDPAR7,R0      ;SEE IF THERE ARE MORE REGISTERS TO TEST
     023716  103344                             BHIS    3$              ;BRANCH IF MORE REGISTERS TO TEST
     023720  012767  023550  155162             MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
     023726  005767  155370                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
     023732  000404                             BR      TST22           ;;BRANCH TO NEXT TEST IF NO ERRORS
     023734  016767  155362  155246             MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR PAR OUT
     023742  104031                             ERROR   +31             ;;SUMMARY OF DUAL ADDRESS TEST
```

```
 1923                                   ;;*****************************************************************
                                        ;*TEST 22       DUAL ADDRESS USER PAR'S,ON LOADING
                                        ;*
                                        ;*THIS TEST FIRST CLEARS ALL THE USER PAGE ADDRESS REGISTERS,
                                        ;*AND CHECKS TO SEE THAT THEY EACH HOLD ZERO.  THEN, STARTING
                                        ;*WITH I-SPACE ADDRESS REGISTER ZERO, ONE REGISTER AT A TIME IS
                                        ;*LOADED WITH A NEGATIVE ONE.  ALL USER ADDRESS REGISTERS ARE
                                        ;*NOW READ TO SEE THAT ONLY THE ONE UNDER TEST IS NON-ZERO.
                                        ;*INDIVIDUAL ERRORS ARE REPORTED AND A SUMMARY OF THEM IS GIVEN
                                        ;*AT THE END OF THIS TEST.
                                        ;;*****************************************************************
 023744  000004                         TST22:  SCOPE
 1924 023746  004767  156324            20$:    JSR     PC,CLEANUP      ;INITIALIZE THE ERROR LOCATIONS
      023752  012767  024000  155130            MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
      023760  012705  177640                    MOV     #UIPAR0,R5      ;PUT ADDRESS OF FIRST PAR IN R5
      023764  004767  156270                    JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
      023770  012700  177640                    MOV     #UIPAR0,R0      ;PUT ADDRESS OF FIRST PAR IN R0
      023774  012701  000020                    MOV     #20,R1          ;BRANCH COUNT IS 16 DECIMAL
      024000  011002                    1$:     MOV     (R0),R2         ;READ PAR TO R2
      024002  001401                            BEQ     2$              ;BRANCH IF PAR IS 0
      024004  104030                            ERROR   +30             ;PAR NOT ZERO
      024006  062700  000002            2$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
      024012  077106                            SOB     R1,1$           ;BRANCH BACK TO 1$ 15 TIMES
                                        ;NOW START DUAL ADDRESSING TEST BY LOADING -1 INTO ONE REGISTER AND
                                        ;READING THE REST TO SEE ONLY THAT REGISTER IS NON ZERO. (ANY
                                        ;DROPPED BITS WILL BE FOUND IN THE NEXT TEST).
      024014  012767  024026  155066            MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
      024022  012700  177640                    MOV     #UIPAR0,R0      ;PUT ADDRESS OF FIRST PAR IN R0
      024026  012705  177640            3$:     MOV     #UIPAR0,R5      ;LOAD STARTING ADDRESS INTO R5
      024032  004767  156222                    JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
      024036  012701  177676                    MOV     #UDPAR7,R1      ;PUT UDPAR7 ADDRESS INTO R1
      024042  012710  177777                    MOV     #-1,(R0)        ;LOAD REGISTER UNDER TEST
      024046  005067  155124            4$:     CLR     $TMP0           ;FLAG TO INDICATE THERE WAS A MATCH
      024052  011102                            MOV     (R1),R2         ;READ ALL REGISTERS
      024054  001406                            BEQ     6$              ;BRANCH IF REGISTER IS 0
      024056  020001                            CMP     R0,R1           ;IS THE ADDRESS OF NON-ZERO REGISTER THE SAME
                                                                        ;AS THE REGISTER UNDER TEST?
      024060  001402                            BEQ     5$              ;BRANCH IF ADDRESSES MATCH
      024062  004767  156246                    JSR     PC,DUALADR      ;LOG AND REPORT ERRORS
      024066  005267  155104            5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
      024072  162701  000002            6$:     SUB     #2,R1           ;POINT TO NEXT REGISTER
      024076  022701  177640                    CMP     #UIPAR0,R1      ;SEE IF ALL REGISTERS HAVE BEEN READ
      024102  101761                            BLOS    4$              ;BRANCH IF MORE TO READ
      024104  062700  000002                    ADD     #2,R0           ;NOW LOAD THE NEXT REGISTER
      024110  022700  177676                    CMP     #UDPAR7,R0      ;SEE IF THERE ARE MORE REGISTERS TO TEST
      024114  103344                            BHIS    3$              ;BRANCH IF MORE REGISTERS TO TEST
      024116  012767  023746  154764            MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
      024124  005767  155172                    TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
      024130  000404                            BR      TST23           ;;BRANCH TO NEXT TEST IF NO ERRORS
      024132  016767  155164  155050            MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR PAR OUT
      024140  104031                            ERROR   +31             ;;SUMMARY OF DUAL ADDRESS TEST
```

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 1929                                   ;;*****************************************************************
                                        ;*TEST 23       DUAL ADDRESS KERNAL PDR'S,ON LOADING
                                        ;*
                                        ;*THIS TEST FIRST CLEARS ALL THE KERNEL PAGE DESCRIPTOR REGISTERS,
                                        ;*AND CHECKS TO SEE THAT THEY EACH HOLD ZERO.  THEN, STARTING
                                        ;*WITH I-SPACE DESCRIPTOR REGISTER ZERO, ONE REGISTER AT A TIME IS
                                        ;*LOADED WITH A NEGATIVE ONE.  ALL KERNEL DESCRIPTOR REGISTERS ARE
                                        ;*NOW READ TO SEE THAT ONLY THE ONE UNDER TEST IS NON-ZERO.
                                        ;*INDIVIDUAL ERRORS ARE REPORTED AND A SUMMARY OF THEM IS GIVEN
                                        ;*AT THE END OF THIS TEST.
                                        ;;*****************************************************************
 024142  000004                         TST23:  SCOPE
 1930 024144  004767  156126            20$:    JSR     PC,CLEANUP      ;INITIALIZE THE ERROR LOCATIONS
      024150  012767  024176  154732            MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
      024156  012705  172300                    MOV     #KIPDR0,R5      ;PUT ADDRESS OF FIRST PDR IN R5
      024162  004767  156072                    JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
      024166  012700  172300                    MOV     #KIPDR0,R0      ;PUT ADDRESS OF FIRST PDR IN R0
      024172  012701  000020                    MOV     #20,R1          ;BRANCH COUNT IS 16 DECIMAL
      024176  011002                    1$:     MOV     (R0),R2         ;READ PDR TO R2
      024200  001401                            BEQ     2$              ;BRANCH IF PDR IS 0
      024202  104030                            ERROR   +30             ;PDR NOT ZERO
      024204  062700  000002            2$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
      024210  077106                            SOB     R1,1$           ;BRANCH BACK TO 1$ 15 TIMES
                                        ;NOW START DUAL ADDRESSING TEST BY LOADING -1 INTO ONE REGISTER AND
                                        ;READING THE REST TO SEE ONLY THAT REGISTER IS NON ZERO. (ANY
                                        ;DROPPED BITS WILL BE FOUND IN THE NEXT TEST).
      024212  012767  024224  154670            MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
      024220  012700  172300                    MOV     #KIPDR0,R0      ;PUT ADDRESS OF FIRST PDR IN R0
      024224  012705  172300            3$:     MOV     #KIPDR0,R5      ;LOAD STARTING ADDRESS INTO R5
      024230  004767  156024                    JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
      024234  012701  172336                    MOV     #KDPDR7,R1      ;PUT KDPDR7 ADDRESS INTO R1
      024240  012710  177777                    MOV     #-1,(R0)        ;LOAD REGISTER UNDER TEST
      024244  005067  154726            4$:     CLR     $TMP0           ;FLAG TO INDICATE THERE WAS A MATCH
      024250  011102                            MOV     (R1),R2         ;READ ALL REGISTERS
      024252  001406                            BEQ     6$              ;BRANCH IF REGISTER IS 0
      024254  020001                            CMP     R0,R1           ;IS THE ADDRESS OF NON-ZERO REGISTER THE SAME
                                                                        ;AS THE REGISTER UNDER TEST?
      024256  001402                            BEQ     5$              ;BRANCH IF ADDRESSES MATCH
      024260  004767  156050                    JSR     PC,DUALADR      ;LOG AND REPORT ERRORS
      024264  005267  154706            5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
      024270  162701  000002            6$:     SUB     #2,R1           ;POINT TO NEXT REGISTER
      024274  022701  172300                    CMP     #KIPDR0,R1      ;SEE IF ALL REGISTERS HAVE BEEN READ
      024300  101761                            BLOS    4$              ;BRANCH IF MORE TO READ
      024302  062700  000002                    ADD     #2,R0           ;NOW LOAD THE NEXT REGISTER
      024306  022700  172336                    CMP     #KDPDR7,R0      ;SEE IF THERE ARE MORE REGISTERS TO TEST
      024312  103344                            BHIS    3$              ;BRANCH IF MORE REGISTERS TO TEST
      024314  012767  024144  154566            MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
      024322  005767  154774                    TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
      024326  000404                            BR      TST24           ;;BRANCH TO NEXT TEST IF NO ERRORS
      024330  016767  154766  154652            MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR PDR OUT
      024336  104031                            ERROR   +31             ;;SUMMARY OF DUAL ADDRESS TEST
```

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1935                                    ;;*****************************************************************
                                        ;*TEST 24       DUAL ADDRESS SUPERVISOR PDR'S,ON LOADING
                                        ;*
                                        ;*THIS TEST FIRST CLEARS ALL THE SUPERVISOR PAGE DESCRIPTOR REGISTERS,
                                        ;*AND CHECKS TO SEE THAT THEY EACH HOLD ZERO.  THEN, STARTING
                                        ;*WITH I-SPACE DESCRIPTOR REGISTER ZERO, ONE REGISTER AT A TIME IS
                                        ;*LOADED WITH A NEGATIVE ONE.  ALL SUPERVISOR DESCRIPTOR REGISTERS ARE
                                        ;*NOW READ TO SEE THAT ONLY THE ONE UNDER TEST IS NON-ZERO.
                                        ;*INDIVIDUAL ERRORS ARE REPORTED AND A SUMMARY OF THEM IS GIVEN
                                        ;*AT THE END OF THIS TEST.
                                        ;;*****************************************************************
024340  000004                          TST24:  SCOPE
1936 024342  004767  155730             20$:    JSR     PC,CLEANUP      ;INITIALIZE THE ERROR LOCATIONS
     024346  012767  024374  154534             MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
     024354  012705  172200                     MOV     #SIPDR0,R5      ;PUT ADDRESS OF FIRST PDR IN R5
     024360  004767  155674                     JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
     024364  012700  172200                     MOV     #SIPDR0,R0      ;PUT ADDRESS OF FIRST PDR IN R0
     024370  012701  000020                     MOV     #20,R1          ;BRANCH COUNT IS 16 DECIMAL
     024374  011002                     1$:     MOV     (R0),R2         ;READ PDR TO R2
     024376  001401                             BEQ     2$              ;BRANCH IF PDR IS 0
     024400  104030                             ERROR   +30             ;PDR NOT ZERO
     024402  062700  000002             2$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
     024406  077106                             SOB     R1,1$           ;BRANCH BACK TO 1$ 15 TIMES
                                        ;NOW START DUAL ADDRESSING TEST BY LOADING -1 INTO ONE REGISTER AND
                                        ;READING THE REST TO SEE ONLY THAT REGISTER IS NON ZERO. (ANY
                                        ;DROPPED BITS WILL BE FOUND IN THE NEXT TEST).
     024410  012767  024422  154472             MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
     024416  012700  172200                     MOV     #SIPDR0,R0      ;PUT ADDRESS OF FIRST PDR IN R0
     024422  012705  172200             3$:     MOV     #SIPDR0,R5      ;LOAD STARTING ADDRESS INTO R5
     024426  004767  155626                     JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
     024432  012701  172236                     MOV     #SDPDR7,R1      ;PUT SDPDR7 ADDRESS INTO R1
     024436  012710  177777                     MOV     #-1,(R0)        ;LOAD REGISTER UNDER TEST
     024442  005067  154530             4$:     CLR     $TMP0           ;FLAG TO INDICATE THERE WAS A MATCH
     024446  011102                             MOV     (R1),R2         ;READ ALL REGISTERS
     024450  001406                             BEQ     6$              ;BRANCH IF REGISTER IS 0
     024452  020001                             CMP     R0,R1           ;IS THE ADDRESS OF NON-ZERO REGISTER THE SAME
                                                                         ;AS THE REGISTER UNDER TEST?
     024454  001402                             BEQ     5$              ;BRANCH IF ADDRESSES MATCH
     024456  004767  155652                     JSR     PC,DUALADR      ;LOG AND REPORT ERRORS
     024462  005267  154510             5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
     024466  162701  000002             6$:     SUB     #2,R1           ;POINT TO NEXT REGISTER
     024472  022701  172200                     CMP     #SIPDR0,R1      ;SEE IF ALL REGISTERS HAVE BEEN READ
     024476  101761                             BLOS    4$              ;BRANCH IF MORE TO READ
     024500  062700  000002                     ADD     #2,R0           ;NOW LOAD THE NEXT REGISTER
     024504  022700  172236                     CMP     #SDPDR7,R0      ;SEE IF THERE ARE MORE REGISTERS TO TEST
     024510  103344                             BHIS    3$              ;BRANCH IF MORE REGISTERS TO TEST
     024512  012767  024342  154370             MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
     024520  005767  154576                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
     024524  000404                             BR      TST25           ;;BRANCH TO NEXT TEST IF NO ERRORS
     024526  016767  154570  154454             MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR PDR OUT
     024534  104031                             ERROR   +31             ;;SUMMARY OF DUAL ADDRESS TEST
```

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1941                                    ;;*********************************************************************
                                        ;*TEST 25       DUAL ADDRESS USER PDR'S,ON LOADING
                                        ;*
                                        ;*THIS TEST FIRST CLEARS ALL THE USER PAGE DESCRIPTOR REGISTERS,
                                        ;*AND CHECKS TO SEE THAT THEY EACH HOLD ZERO.  THEN, STARTING
                                        ;*WITH I-SPACE DESCRIPTOR REGISTER ZERO, ONE REGISTER AT A TIME IS
                                        ;*LOADED WITH A NEGATIVE ONE.  ALL USER DESCRIPTOR REGISTERS ARE
                                        ;*NOW READ TO SEE THAT ONLY THE ONE UNDER TEST IS NON-ZERO.
                                        ;*INDIVIDUAL ERRORS ARE REPORTED AND A SUMMARY OF THEM IS GIVEN
                                        ;*AT THE END OF THIS TEST.
                                        ;;*********************************************************************
024536  000004                          TST25:  SCOPE
1942 024540  004767  155532             20$:    JSR     PC,CLEANUP      ;INITIALIZE THE ERROR LOCATIONS
     024544  012767  024572  154336             MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
     024552  012705  177600                     MOV     #UIPDR0,R5      ;PUT ADDRESS OF FIRST PDR IN R5
     024556  004767  155476                     JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
     024562  012700  177600                     MOV     #UIPDR0,R0      ;PUT ADDRESS OF FIRST PDR IN R0
     024566  012701  000020                     MOV     #20,R1          ;BRANCH COUNT IS 16 DECIMAL
     024572  011002                     1$:     MOV     (R0),R2         ;READ PDR TO R2
     024574  001401                             BEQ     2$              ;BRANCH IF PDR IS 0
     024576  104030                             ERROR   +30             ;PDR NOT ZERO
     024600  062700  000002             2$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
     024604  077106                             SOB     R1,1$           ;BRANCH BACK TO 1$ 15 TIMES
                                        ;NOW START DUAL ADDRESSING TEST BY LOADING -1 INTO ONE REGISTER AND
                                        ;READING THE REST TO SEE ONLY THAT REGISTER IS NON ZERO. (ANY
                                        ;DROPPED BITS WILL BE FOUND IN THE NEXT TEST).
     024606  012767  024620  154274             MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
     024614  012700  177600                     MOV     #UIPDR0,R0      ;PUT ADDRESS OF FIRST PDR IN R0
     024620  012705  177600             3$:     MOV     #UIPDR0,R5      ;LOAD STARTING ADDRESS INTO R5
     024624  004767  155430                     JSR     PC,CLRREG       ;CLEAR 16 REGISTERS POINTED TO BY R5
     024630  012701  177636                     MOV     #UDPDR7,R1      ;PUT UDPDR7 ADDRESS INTO R1
     024634  012710  177777                     MOV     #-1,(R0)        ;LOAD REGISTER UNDER TEST
     024640  005067  154332             4$:     CLR     $TMP0           ;FLAG TO INDICATE THERE WAS A MATCH
     024644  011102                             MOV     (R1),R2         ;READ ALL REGISTERS
     024646  001406                             BEQ     6$              ;BRANCH IF REGISTER IS 0
     024650  020001                             CMP     R0,R1           ;IS THE ADDRESS OF NON-ZERO REGISTER THE SAME
                                                                         ;AS THE REGISTER UNDER TEST?
     024652  001402                             BEQ     5$              ;BRANCH IF ADDRESSES MATCH
     024654  004767  155454                     JSR     PC,DUALADR      ;LOG AND REPORT ERRORS
     024660  005267  154312             5$:     INC     $TMP0           ;SET FLAG WHEN ADDRESSES MATCH
     024664  162701  000002             6$:     SUB     #2,R1           ;POINT TO NEXT REGISTER
     024670  022701  177600                     CMP     #UIPDR0,R1      ;SEE IF ALL REGISTERS HAVE BEEN READ
     024674  101761                             BLOS    4$              ;BRANCH IF MORE TO READ
     024676  062700  000002                     ADD     #2,R0           ;NOW LOAD THE NEXT REGISTER
     024702  022700  177636                     CMP     #UDPDR7,R0      ;SEE IF THERE ARE MORE REGISTERS TO TEST
     024706  103344                             BHIS    3$              ;BRANCH IF MORE REGISTERS TO TEST
     024710  012767  024540  154172             MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
     024716  005767  154400                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
     024722  000404                             BR      TST26           ;;BRANCH TO NEXT TEST IF NO ERRORS
     024724  016767  154372  154256             MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR PDR OUT
     024732  104031                             ERROR   +31             ;;SUMMARY OF DUAL ADDRESS TEST
1943
1959                                    ;;*********************************************************************
                                        ;*TEST 26       COUNT PATTERN IN KERNAL PAR'S
                                        ;*
                                        ;*THIS TEST RUNS A COUNT PATTERN THROUGH THE KERNAL PAGE ADDRESS REGISTERS.
                                        ;*IF THE COUNT PATTERN DOES NOT MATCH THE DATA RECEVIED, THE REGISTER ADDRESS,
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                                        ;*DATA PATTERN, AND BAD DATA ARE REPORTED.  AT THE END OF THE TEST A SUMMARY
                                        ;*OF ERRORS IS GIVEN.
                                        ;;*****************************************************************
 024734  000004                         TST26:  SCOPE
1960 024736  004767  155334             20$:    JSR     PC,CLEANUP      ;INITIALIZE ERROR LOCATIONS
 024742  012767  024752  154140                 MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
 024750  005001                                 CLR     R1              ;CLEAR REGISTER TO HOLD COUNT PATTERN
 024752  012700  172340             1$:     MOV     #KIPAR0,R0      ;PUT ADDRESS OF FIRST REGISTER INTO R0
 024756  010110                     2$:     MOV     R1,(R0)         ;LOAD COUNT INTO REGISTER
 024760  011002                             MOV     (R0),R2         ;READ REGISTER BACK TO R2
 024762  010104                             MOV     R1,R4           ;PUT PATTERN IN R4
 024764  020402                             CMP     R4,R2           ;SEE IF DATA MATCHES PATTERN
 024766  001402                             BEQ     3$              ;BRANCH IF DATA IS GOOD
 024770  004767  155404                     JSR     PC,PARCOUNT     ;LOG AND REPORT COUNT ERROR
 024774  062700  000002             3$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
 025000  022700  172376                     CMP     #KDPAR7,R0      ;SEE IF YOU PASSED THE KDPAR7 PAR
 025004  103364                             BHIS    2$              ;BRANCH IF MORE TEST
 025006  022701  177777                     CMP     #177777,R1      ;SEE IF COUNT HAS REACHED 177777
 025012  001403                             BEQ     4$              ;BRANCH IF SO
 025014  062701  000401                     ADD     #401,R1         ;INCREASE COUNT PATTERN
 025020  000754                             BR      1$              ;BRANCH TO CONTINUE TEST
 025022  012767  024736  154060     4$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
 025030  005767  154266                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
 025034  000404                             BR      TST27           ;;BRANCH TO NEXT TEST IF NO ERRORS
 025036  016767  154260  154144             MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR TYPEOUT
 025044  104032                             ERROR   +32             ;SUMMARY OF COUNT PATTERN FAILURES
1961
1965                                    ;;*****************************************************************
                                        ;*TEST 27        COUNT PATTERN IN SUPERVISOR PAR'S
                                        ;*
                                        ;*THIS TEST RUNS A COUNT PATTERN THROUGH THE SUPERVISOR PAGE ADDRESS REGISTERS.
                                        ;*IF THE COUNT PATTERN DOES NOT MATCH THE DATA RECEVIED, THE REGISTER ADDRESS,
                                        ;*DATA PATTERN, AND BAD DATA ARE REPORTED.  AT THE END OF THE TEST A SUMMARY
                                        ;*OF ERRORS IS GIVEN.
                                        ;;*****************************************************************
 025046  000004                         TST27:  SCOPE
1966 025050  004767  155222             20$:    JSR     PC,CLEANUP      ;INITIALIZE ERROR LOCATIONS
 025054  012767  025064  154026                 MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
 025062  005001                                 CLR     R1              ;CLEAR REGISTER TO HOLD COUNT PATTERN
 025064  012700  172240             1$:     MOV     #SIPAR0,R0      ;PUT ADDRESS OF FIRST REGISTER INTO R0
 025070  010110                     2$:     MOV     R1,(R0)         ;LOAD COUNT INTO REGISTER
 025072  011002                             MOV     (R0),R2         ;READ REGISTER BACK TO R2
 025074  010104                             MOV     R1,R4           ;PUT PATTERN IN R4
 025076  020402                             CMP     R4,R2           ;SEE IF DATA MATCHES PATTERN
 025100  001402                             BEQ     3$              ;BRANCH IF DATA IS GOOD
 025102  004767  155272                     JSR     PC,PARCOUNT     ;LOG AND REPORT COUNT ERROR
 025106  062700  000002             3$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
 025112  022700  172276                     CMP     #SDPAR7,R0      ;SEE IF YOU PASSED THE SDPAR7 PAR
 025116  103364                             BHIS    2$              ;BRANCH IF MORE TEST
 025120  022701  177777                     CMP     #177777,R1      ;SEE IF COUNT HAS REACHED 177777
 025124  001403                             BEQ     4$              ;BRANCH IF SO
 025126  062701  000401                     ADD     #401,R1         ;INCREASE COUNT PATTERN
 025132  000754                             BR      1$              ;BRANCH TO CONTINUE TEST
 025134  012767  025050  153746     4$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
 025142  005767  154154                     TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
 025146  000404                             BR      TST30           ;;BRANCH TO NEXT TEST IF NO ERRORS
 025150  016767  154146  154032             MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR TYPEOUT
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      025156  104032                          ERROR   +32             ;SUMMARY OF COUNT PATTERN FAILURES
 1967
 1971                                 ;;*****************************************************************
                                      ;*TEST 30       COUNT PATTERN IN USER PAR'S
                                      ;*
                                      ;*THIS TEST RUNS A COUNT PATTERN THROUGH THE USER PAGE ADDRESS REGISTERS.
                                      ;*IF THE COUNT PATTERN DOES NOT MATCH THE DATA RECEVIED, THE REGISTER ADDRESS,
                                      ;*DATA PATTERN, AND BAD DATA ARE REPORTED.  AT THE END OF THE TEST A SUMMARY
                                      ;*OF ERRORS IS GIVEN.
                                      ;;*****************************************************************
      025160  000004                  TST30:  SCOPE
 1972 025162  004767  155110          20$:    JSR     PC,CLEANUP      ;INITIALIZE ERROR LOCATIONS
      025166  012767  025176  153714          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
      025174  005001                          CLR     R1              ;CLEAR REGISTER TO HOLD COUNT PATTERN
      025176  012700  172340          1$:     MOV     #KIPAR0,R0      ;PUT ADDRESS OF FIRST REGISTER INTO R0
      025202  010110                  2$:     MOV     R1,(R0)         ;LOAD COUNT INTO REGISTER
      025204  011002                          MOV     (R0),R2         ;READ REGISTER BACK TO R2
      025206  010104                          MOV     R1,R4           ;PUT PATTERN IN R4
      025210  020402                          CMP     R4,R2           ;SEE IF DATA MATCHES PATTERN
      025212  001402                          BEQ     3$              ;BRANCH IF DATA IS GOOD
      025214  004767  155160                  JSR     PC,PARCOUNT     ;LOG AND REPORT COUNT ERROR
      025220  062700  000002          3$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
      025224  022700  172376                  CMP     #KDPAR7,R0      ;SEE IF YOU PASSED THE KDPAR7 PAR
      025230  103364                          BHIS    2$              ;BRANCH IF MORE TEST
      025232  022701  177777                  CMP     #177777,R1      ;SEE IF COUNT HAS REACHED 177777
      025236  001403                          BEQ     4$              ;BRANCH IF SO
      025240  062701  000401                  ADD     #401,R1         ;INCREASE COUNT PATTERN
      025244  000754                          BR      1$              ;BRANCH TO CONTINUE TEST
      025246  012767  025162  153634  4$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
      025254  005767  154042                  TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
      025260  000404                          BR      TST31           ;;BRANCH TO NEXT TEST IF NO ERRORS
      025262  016767  154034  153720          MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR TYPEOUT
      025270  104032                          ERROR   +32             ;SUMMARY OF COUNT PATTERN FAILURES
 1973
 1977                                 ;;*****************************************************************
                                      ;*TEST 31       COUNT PATTERN IN KERNAL PDR'S
                                      ;*
                                      ;*THIS TEST RUNS A COUNT PATTERN THROUGH THE KERNAL PAGE DESCRIPTOR REGISTERS.
                                      ;*SINCE BITS <05:04> AND <0> ARE NOT INPLEMENTED, AND BITS <07:06>
                                      ;*CANNOT BE SET BY DIRECT LOAD, THEY ARE MASKED OUT OF THE DATA COMPARE.
                                      ;*THESE BITS ARE STILL SENT TO THE DESCRIPTOR REGISTER TO FIND BAD ETCHES.
                                      ;*IF THE COUNT PATTERN DOES NOT MATCH THE DATA RECEVIED, THE REGISTER ADDRESS,
                                      ;*DATA PATTERN, AND BAD DATA ARE REPORTED.  AT THE END OF THE TEST A SUMMARY
                                      ;*OF ERRORS IS GIVEN.
                                      ;;*****************************************************************
      025272  000004                  TST31:  SCOPE
 1978 025274  004767  154776          20$:    JSR     PC,CLEANUP      ;INITIALIZE ERROR LOCATIONS
      025300  012767  025310  153602          MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
      025306  005001                          CLR     R1              ;CLEAR REGISTER TO HOLD COUNT PATTERN
      025310  012700  172300          1$:     MOV     #KIPDR0,R0      ;PUT ADDRESS OF FIRST REGISTER INTO R0
      025314  010110                  2$:     MOV     R1,(R0)         ;LOAD COUNT INTO REGISTER
      025316  011002                          MOV     (R0),R2         ;READ REGISTER BACK TO R2
      025320  010104                          MOV     R1,R4           ;PUT PATTERN IN R4
      025322  042704  000361                  BIC     #000361,R4      ;CLEAR BITS NOT FOUND IN REGISTER
      025326  020402                          CMP     R4,R2           ;SEE IF DATA MATCHES PATTERN
      025330  001402                          BEQ     3$              ;BRANCH IF DATA IS GOOD
      025332  004767  155042                  JSR     PC,PARCOUNT     ;LOG AND REPORT COUNT ERROR
```

```
025336  062700  000002          3$:   ADD     #2,R0           ;POINT TO NEXT REGISTER
025342  022700  172336                CMP     #KDPDR7,R0      ;SEE IF YOU PASSED THE KDPDR7 PDR
025346  103362                        BHIS    2$              ;BRANCH IF MORE TEST
025350  022701  177777                CMP     #177777,R1      ;SEE IF COUNT HAS REACHED 177777
025354  001403                        BEQ     4$              ;BRANCH IF SO
025356  062701  000401                ADD     #401,R1         ;INCREASE COUNT PATTERN
025362  000752                        BR      1$              ;BRANCH TO CONTINUE TEST
025364  012767  025274  153516  4$:   MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
025372  005767  153724                TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
025376  000404                        BR      TST32           ;;BRANCH TO NEXT TEST IF NO ERRORS
025400  016767  153716  153602        MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR TYPEOUT
025406  104032                        ERROR   +32             ;SUMMARY OF COUNT PATTERN FAILURES
1979
```

```
                                ;;*****************************************************************
                                ;*TEST 32       COUNT PATTERN IN SUPERVISOR PDR'S
                                ;*
                                ;*THIS TEST RUNS A COUNT PATTERN THROUGH THE SUPERVISOR PAGE DESCRIPTOR REGISTERS.
                                ;*SINCE BITS <05:04> AND <0> ARE NOT INPLEMENTED, AND BITS <07:06>
                                ;*CANNOT BE SET BY DIRECT LOAD, THEY ARE MASKED OUT OF THE DATA COMPARE.
                                ;*THESE BITS ARE STILL SENT TO THE DESCRIPTOR REGISTER TO FIND BAD ETCHES.
                                ;*IF THE COUNT PATTERN DOES NOT MATCH THE DATA RECEVIED, THE REGISTER ADDRESS,
                                ;*DATA PATTERN, AND BAD DATA ARE REPORTED.  AT THE END OF THE TEST A SUMMARY
                                ;*OF ERRORS IS GIVEN.
                                ;;*****************************************************************
025410  000004                  TST32:  SCOPE
1985 025412  004767  154660     20$:    JSR     PC,CLEANUP      ;INITIALIZE ERROR LOCATIONS
     025416  012767  025426  153464       MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
     025424  005001               1$:     CLR     R1              ;CLEAR REGISTER TO HOLD COUNT PATTERN
     025426  012700  172200       2$:     MOV     #SIPDR0,R0      ;PUT ADDRESS OF FIRST REGISTER INTO R0
     025432  010110               3$:     MOV     R1,(R0)         ;LOAD COUNT INTO REGISTER
     025434  011002                       MOV     (R0),R2         ;READ REGISTER BACK TO R2
     025436  010104                       MOV     R1,R4           ;PUT PATTERN IN R4
     025440  042704  000361               BIC     #000361,R4      ;CLEAR BITS NOT FOUND IN REGISTER
     025444  020402                       CMP     R4,R2           ;SEE IF DATA MATCHES PATTERN
     025446  001402                       BEQ     3$              ;BRANCH IF DATA IS GOOD
     025450  004767  154724               JSR     PC,PARCOUNT     ;LOG AND REPORT COUNT ERROR
     025454  062700  000002       3$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
     025460  022700  172236               CMP     #SDPDR7,R0      ;SEE IF YOU PASSED THE SDPDR7 PDR
     025464  103362                       BHIS    2$              ;BRANCH IF MORE TEST
     025466  022701  177777               CMP     #177777,R1      ;SEE IF COUNT HAS REACHED 177777
     025472  001403                       BEQ     4$              ;BRANCH IF SO
     025474  062701  000401               ADD     #401,R1         ;INCREASE COUNT PATTERN
     025500  000752                       BR      1$              ;BRANCH TO CONTINUE TEST
     025502  012767  025412  153400  4$:  MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
     025510  005767  153606               TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
     025514  000404                       BR      TST33           ;;BRANCH TO NEXT TEST IF NO ERRORS
     025516  016767  153600  153464       MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR TYPEOUT
     025524  104032                       ERROR   +32             ;SUMMARY OF COUNT PATTERN FAILURES
1986
1990                            ;;*****************************************************************
                                ;*TEST 33       COUNT PATTERN IN USER PDR'S
                                ;*
                                ;*THIS TEST RUNS A COUNT PATTERN THROUGH THE USER PAGE ADDRESS REGISTERS.
                                ;*SINCE BITS <05:04> AND <0> ARE NOT INPLEMENTED, AND BITS <07:06>
                                ;*CANNOT BE SET BY DIRECT LOAD, THEY ARE MASKED OUT OF THE DATA COMPARE.
                                ;*THESE BITS ARE STILL SENT TO THE DESCRIPTOR REGISTER TO FIND BAD ETCHES.
                                ;*IF THE COUNT PATTERN DOES NOT MATCH THE DATA RECEVIED, THE REGISTER ADDRESS,
                                ;*DATA PATTERN, AND BAD DATA ARE REPORTED.  AT THE END OF THE TEST A SUMMARY
                                ;*OF ERRORS IS GIVEN.
                                ;;*****************************************************************
025526  000004                  TST33:  SCOPE
1991 025530  004767  154542     20$:    JSR     PC,CLEANUP      ;INITIALIZE ERROR LOCATIONS
     025534  012767  025544  153346       MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
     025542  005001               1$:     CLR     R1              ;CLEAR REGISTER TO HOLD COUNT PATTERN
     025544  012700  177600       2$:     MOV     #UIPDR0,R0      ;PUT ADDRESS OF FIRST REGISTER INTO R0
     025550  010110               3$:     MOV     R1,(R0)         ;LOAD COUNT INTO REGISTER
     025552  011002                       MOV     (R0),R2         ;READ REGISTER BACK TO R2
     025554  010104                       MOV     R1,R4           ;PUT PATTERN IN R4
     025556  042704  000361               BIC     #000361,R4      ;CLEAR BITS NOT FOUND IN REGISTER
     025562  020402                       CMP     R4,R2           ;SEE IF DATA MATCHES PATTERN
```

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025564  001402                          BEQ     3$              ;BRANCH IF DATA IS GOOD
025566  004767  154606                  JSR     PC,PARCOUNT     ;LOG AND REPORT COUNT ERROR
025572  062700  000002          3$:     ADD     #2,R0           ;POINT TO NEXT REGISTER
025576  022700  177636                  CMP     #UDPDR7,R0      ;SEE IF YOU PASSED THE UDPDR7 PDR
025602  103362                          BHIS    2$              ;BRANCH IF MORE TEST
025604  022701  177777                  CMP     #177777,R1      ;SEE IF COUNT HAS REACHED 177777
025610  001403                          BEQ     4$              ;BRANCH IF SO
025612  062701  000401                  ADD     #401,R1         ;INCREASE COUNT PATTERN
025616  000752                          BR      1$              ;BRANCH TO CONTINUE TEST
025620  012767  025530  153262  4$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
025626  005767  153470                  TST     ERRCNT          ;SEE IF THERE WERE ANY ERRORS
025632  000404                          BR      TST34           ;;BRANCH TO NEXT TEST IF NO ERRORS
025634  016767  153462  153346          MOV     ERRCNT,$TMP5    ;SAVE # OF ERRORS FOR TYPEOUT
025642  104032                          ERROR   +32             ;SUMMARY OF COUNT PATTERN FAILURES
1992
2000
2004                                    ;;*****************************************************************
                                        ;*TEST 34        BYTE ADDRESSING OF KERNAL PAR'S
                                        ;*
                                        ;*      THIS TEST CHECK THE LOGIC ASSOCIATED WITH BYTE ADDRESSING
                                        ;*      OF KERNAL PAGE ADDRESS REGISTERS.  IT CAN BE ASSUMED THAT IF
                                        ;*      ONE REGISTER WORKS, THEY ALL WORK BECAUSE THE REGISTERS
                                        ;*      HAVE ALL BEEN TESTED.
                                        ;;*****************************************************************
025644  000004                  TST34:  SCOPE
2005 025646  012767  025664  153234  20$:     MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
025654  012702  000014                  MOV     #14,R2          ;PUT EXPECTED DATA IN R2
025660  012700  172340                  MOV     #KIPAR0,R0      ;PUT ADDRESS OF REGISTER IN R0
025664  005067  144450          11$:    CLR     KIPAR0          ;CLEAR THE REGISTER UNDER TEST
025670  112710  172014                  MOVB    #172014,(R0)    ;LOAD LOWER BYTE OF REGISTER
025674  016701  144440                  MOV     KIPAR0,R1       ;READ REGISTER INTO R1
025700  020102                          CMP     R1,R2           ;SEE IF ONLY LOWER BYTE WAS WRITTEN
025702  001401                          BEQ     1$              ;BRANCH IF DATA MATCHES
025704  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
025706  012767  025724  153174  1$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
025714  012700  172341                  MOV     #KIPAR0+1,R0    ;POINT TO UPPER BYTE OF REGISTER
025720  012702  052014                  MOV     #52014,R2       ;LOAD EXPECTED DATA INTO R2
025724  112710  000124          12$:    MOVB    #124,(R0)       ;WRITE UPPER BYTE OF REGISTER
025730  016701  144404                  MOV     KIPAR0,R1       ;READ REGISTER INTO R1
025734  020102                          CMP     R1,R2           ;SEE IF ONLY UPPER BYTE WAS WRITTEN
025736  001401                          BEQ     2$              ;BRANCH TO EXIT IF CORRECT
025740  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
025742  012767  025646  153140  2$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
2009                                    ;;*****************************************************************
                                        ;*TEST 35        BYTE ADDRESSING OF SUPERVISOR PAR'S
                                        ;*
                                        ;*      THIS TEST CHECK THE LOGIC ASSOCIATED WITH BYTE ADDRESSING
                                        ;*      OF SUPERVISOR PAGE ADDRESS REGISTERS.  IT CAN BE ASSUMED THAT IF
                                        ;*      ONE REGISTER WORKS, THEY ALL WORK BECAUSE THE REGISTERS
                                        ;*      HAVE ALL BEEN TESTED.
                                        ;;*****************************************************************
025750  000004                  TST35:  SCOPE
2010 025752  012767  025770  153130  20$:     MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
025760  012702  000014                  MOV     #14,R2          ;PUT EXPECTED DATA IN R2
025764  012700  172240                  MOV     #SIPAR0,R0      ;PUT ADDRESS OF REGISTER IN R0
025770  005067  144244          11$:    CLR     SIPAR0          ;CLEAR THE REGISTER UNDER TEST
025774  112710  172014                  MOVB    #172014,(R0)    ;LOAD LOWER BYTE OF REGISTER
```

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                                                                I 5
        026000  016701  144234                  MOV     SIPAR0,R1       ;READ REGISTER INTO R1
        026004  020102                          CMP     R1,R2           ;SEE IF ONLY LOWER BYTE WAS WRITTEN
        026006  001401                          BEQ     1$              ;BRANCH IF DATA MATCHES
        026010  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
        026012  012767  026030  153070  1$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
        026020  012700  172241                  MOV     #SIPAR0+1,R0    ;POINT TO UPPER BYTE OF REGISTER
        026024  012702  052014                  MOV     #52014,R2       ;LOAD EXPECTED DATA INTO R2
        026030  112710  000124          12$:    MOVB    #124,(R0)       ;WRITE UPPER BYTE OF REGISTER
        026034  016701  144200                  MOV     SIPAR0,R1       ;READ REGISTER INTO R1
        026040  020102                          CMP     R1,R2           ;SEE IF ONLY UPPER BYTE WAS WRITTEN
        026042  001401                          BEQ     2$              ;BRANCH TO EXIT IF CORRECT
        026044  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
        026046  012767  025752  153034  2$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
  2014                                  ;;**************************************************************************
                                        ;*TEST 36        BYTE ADDRESSING OF USER PAR'S
                                        ;*
                                        ;*      THIS TEST CHECK THE LOGIC ASSOCIATED WITH BYTE ADDRESSING
                                        ;*      OF USER PAGE ADDRESS REGISTERS.  IT CAN BE ASSUMED THAT IF
                                        ;*      ONE REGISTER WORKS, THEY ALL WORK BECAUSE THE REGISTERS
                                        ;*      HAVE ALL BEEN TESTED.
                                        ;;**************************************************************************
        026054  000004                  TST36:  SCOPE
  2015  026056  012767  026074  153024  20$:    MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
        026064  012702  000014                  MOV     #14,R2          ;PUT EXPECTED DATA IN R2
        026070  012700  177640                  MOV     #UIPAR0,R0      ;PUT ADDRESS OF REGISTER IN R0
        026074  005067  151540          11$:    CLR     UIPAR0          ;CLEAR THE REGISTER UNDER TEST
        026100  112710  172014                  MOVB    #172014,(R0)    ;LOAD LOWER BYTE OF REGISTER
        026104  016701  151530                  MOV     UIPAR0,R1       ;READ REGISTER INTO R1
        026110  020102                          CMP     R1,R2           ;SEE IF ONLY LOWER BYTE WAS WRITTEN
        026112  001401                          BEQ     1$              ;BRANCH IF DATA MATCHES
        026114  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
        026116  012767  026134  152764  1$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
        026124  012700  177641                  MOV     #UIPAR0+1,R0    ;POINT TO UPPER BYTE OF REGISTER
        026130  012702  052014                  MOV     #52014,R2       ;LOAD EXPECTED DATA INTO R2
        026134  112710  000124          12$:    MOVB    #124,(R0)       ;WRITE UPPER BYTE OF REGISTER
        026140  016701  151474                  MOV     UIPAR0,R1       ;READ REGISTER INTO R1
        026144  020102                          CMP     R1,R2           ;SEE IF ONLY UPPER BYTE WAS WRITTEN
        026146  001401                          BEQ     2$              ;BRANCH TO EXIT IF CORRECT
        026150  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
        026152  012767  026056  152730  2$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
  2019                                  ;;**************************************************************************
                                        ;*TEST 37        BYTE ADDRESSING OF KERNAL PDR'S
                                        ;*
                                        ;*      THIS TEST CHECK THE LOGIC ASSOCIATED WITH BYTE ADDRESSING
                                        ;*      OF KERNAL PAGE DESCRIPTOR REGISTERS.  IT CAN BE ASSUMED THAT IF
                                        ;*      ONE REGISTER WORKS, THEY ALL WORK BECAUSE THE REGISTERS
                                        ;*      HAVE ALL BEEN TESTED.
                                        ;;**************************************************************************
        026160  000004                  TST37:  SCOPE
  2020  026162  012767  026200  152720  20$:    MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
        026170  012702  000014                  MOV     #14,R2          ;PUT EXPECTED DATA IN R2
        026174  012700  172300                  MOV     #KIPDR0,R0      ;PUT ADDRESS OF REGISTER IN R0
        026200  005067  144074          11$:    CLR     KIPDR0          ;CLEAR THE REGISTER UNDER TEST
        026204  112710  172014                  MOVB    #172014,(R0)    ;LOAD LOWER BYTE OF REGISTER
        026210  016701  144064                  MOV     KIPDR0,R1       ;READ REGISTER INTO R1
        026214  020102                          CMP     R1,R2           ;SEE IF ONLY LOWER BYTE WAS WRITTEN
        026216  001401                          BEQ     1$              ;BRANCH IF DATA MATCHES
```

```
026220  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
026222  012767  026240  152660  1$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
026230  012700  172301                  MOV     #KIPDR0+1,R0    ;POINT TO UPPER BYTE OF REGISTER
026234  012702  052014                  MOV     #52014,R2       ;LOAD EXPECTED DATA INTO R2
026240  112710  000124          12$:    MOVB    #124,(R0)       ;WRITE UPPER BYTE OF REGISTER
026244  016701  144030                  MOV     KIPDR0,R1       ;READ REGISTER INTO R1
026250  020102                          CMP     R1,R2           ;SEE IF ONLY UPPER BYTE WAS WRITTEN
026252  001401                          BEQ     2$              ;BRANCH TO EXIT IF CORRECT
026254  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
026256  012767  026162  152624  2$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
2024                                    ;;**************************************************************
                                        ;*TEST 40        BYTE ADDRESSING OF SUPERVISOR PDR'S
                                        ;*
                                        ;*      THIS TEST CHECK THE LOGIC ASSOCIATED WITH BYTE ADDRESSING
                                        ;*      OF KERNAL PAGE DESCRIPTOR REGISTERS.  IT CAN BE ASSUMED THAT IF
                                        ;*      ONE REGISTER WORKS, THEY ALL WORK BECAUSE THE REGISTERS
                                        ;*      HAVE ALL BEEN TESTED.
                                        ;;**************************************************************
026264  000004                  TST40:  SCOPE
2025 026266  012767  026304  152614  20$:     MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
026274  012702  000014                  MOV     #14,R2          ;PUT EXPECTED DATA IN R2
026300  012700  172200                  MOV     #SIPDR0,R0      ;PUT ADDRESS OF REGISTER IN R0
026304  005067  143670          11$:    CLR     SIPDR0          ;CLEAR THE REGISTER UNDER TEST
026310  112710  172014                  MOVB    #172014,(R0)    ;LOAD LOWER BYTE OF REGISTER
026314  016701  143660                  MOV     SIPDR0,R1       ;READ REGISTER INTO R1
026320  020102                          CMP     R1,R2           ;SEE IF ONLY LOWER BYTE WAS WRITTEN
026322  001401                          BEQ     1$              ;BRANCH IF DATA MATCHES
026324  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
026326  012767  026344  152554  1$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
026334  012700  172201                  MOV     #SIPDR0+1,R0    ;POINT TO UPPER BYTE OF REGISTER
026340  012702  052014                  MOV     #52014,R2       ;LOAD EXPECTED DATA INTO R2
026344  112710  000124          12$:    MOVB    #124,(R0)       ;WRITE UPPER BYTE OF REGISTER
026350  016701  143624                  MOV     SIPDR0,R1       ;READ REGISTER INTO R1
026354  020102                          CMP     R1,R2           ;SEE IF ONLY UPPER BYTE WAS WRITTEN
026356  001401                          BEQ     2$              ;BRANCH TO EXIT IF CORRECT
026360  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
026362  012767  026266  152520  2$:     MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
2029                                    ;;**************************************************************
                                        ;*TEST 41        BYTE ADDRESSING OF USER PDR'S
                                        ;*
                                        ;*      THIS TEST CHECK THE LOGIC ASSOCIATED WITH BYTE ADDRESSING
                                        ;*      OF USER PAGE DESCRIPTOR REGISTERS.  IT CAN BE ASSUMED THAT IF
                                        ;*      ONE REGISTER WORKS, THEY ALL WORK BECAUSE THE REGISTERS
                                        ;*      HAVE ALL BEEN TESTED.
                                        ;;**************************************************************
026370  000004                  TST41:  SCOPE
2030 026372  012767  026410  152510  20$:     MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
026400  012702  000014                  MOV     #14,R2          ;PUT EXPECTED DATA IN R2
026404  012700  177600                  MOV     #UIPDR0,R0      ;PUT ADDRESS OF REGISTER IN R0
026410  005067  151164          11$:    CLR     UIPDR0          ;CLEAR THE REGISTER UNDER TEST
026414  112710  172014                  MOVB    #172014,(R0)    ;LOAD LOWER BYTE OF REGISTER
026420  016701  151154                  MOV     UIPDR0,R1       ;READ REGISTER INTO R1
026424  020102                          CMP     R1,R2           ;SEE IF ONLY LOWER BYTE WAS WRITTEN
026426  001401                          BEQ     1$              ;BRANCH IF DATA MATCHES
026430  104033                          ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
026432  012767  026450  152450  1$:     MOV     #12$,$LPERR     ;SET LOOP ON ERROR POINTER TO 12$
026440  012700  177601                  MOV     #UIPDR0+1,R0    ;POINT TO UPPER BYTE OF REGISTER
```

```
026444  012702  052014              MOV     #52014,R2       ;LOAD EXPECTED DATA INTO R2
026450  112710  000124      12$:    MOVB    #124,(R0)       ;WRITE UPPER BYTE OF REGISTER
026454  016701  151120              MOV     UIPDR0,R1       ;READ REGISTER INTO R1
026460  020102                      CMP     R1,R2           ;SEE IF ONLY UPPER BYTE WAS WRITTEN
026462  001401                      BEQ     2$              ;BRANCH TO EXIT IF CORRECT
026464  104033                      ERROR   +33             ;DIDN'T LOAD CORRECT BYTE
026466  012767  026372  152414  2$: MOV     #20$,$LPERR     ;SET LOOP POINTER TO START OF TEST
```

```
                                        ;;*****************************************************************
                                        ;*TEST 42       DUAL ADDRESSING FOR ALL PAR'S & PDR'S
                                        ;*
                                        ;*      THIS TEST WILL ENSURE THAT THERE IS NO DUAL ADDRESSING
                                        ;*      BETWEEN GROUPS OF PAR'S AND PDR'S.  THAT IS, WHEN YOU
                                        ;*      REFERENCE A KERNAL I-SPACE PAR YOU ARE REALLY REFERENCING
                                        ;*      THAT PAR. FIRST EACH I-SPACE PAR0 OR PDR0 IS LOADED WITH
                                        ;*      A UNIQUE NUMBER 0-12 AND THEN THEY ARE EACH CHECKED FOR
                                        ;*      THE CORRECT DATA.
                                        ;*      EACH GROUP HAS ALREADY BEEN TESTED FOR DUAL ADDRESSING
                                        ;*      WITHIN ITS OWN GROUP, SO ONLY ONE REGISTER FROM EACH
                                        ;*      GROUP NEEDS TO BE TESTED.
                                        ;*
                                        ;;*****************************************************************
    026474  000004                      TST42:  SCOPE
2046 026476  012767  026512  152404     20$:    MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
2047 026504  005000                             CLR     R0              ;THIS WILL HOLD THE INDEX OF EACH
2048                                                                    ;REGISTER, AND THE COUNT LOADED.
2049 026506  012704  000006                     MOV     #6,R4           ;NUMBER OF TIMES TO DO THE LOOP
2050 026512  010070  001356             1$:     MOV     R0,@PARTAB(R0)  ;LOAD PAR OR PDR WITH INDEX NUMBER
2051 026516  062700  000002                     ADD     #2,R0           ;CHANGE INDEX TO POINT TO NEXT REGISTER
2052 026522  077405                             SOB     R4,1$           ;BRANCH BACK 5 TIMES
2053 026524  012704  000006                     MOV     #6,R4           ;DO NEXT LOOP 6 TIMES
2054 026530  016767  000006  152352             MOV     10$,$LPERR      ;SET LOOP ON ERROR POINTER TO 10$
2055 026536  162700  000002             2$:     SUB     #2,R0           ;ADJUST INDEX FOR REGISTER DESIRED
2056 026542  017001  001356             10$:    MOV     @PARTAB(R0),R1  ;READ PAR OR PDR INTO R1
2057 026546  020001                             CMP     R0,R1           ;SEE IF INDEX EQUALS DATA
2058 026550  001403                             BEQ     3$              ;BRANCH IF INCORRECT REGISTER WAS READ
2059 026552  016002  001356                     MOV     PARTAB(R0),R2   ;SAVE ADDRESS OF BAD REGISTER
2060 026556  104016                             ERROR   +16             ;DUAL ADDRESSING ERROR
2061 026560  077412                     3$:     SOB     R4,2$           ;BRANCH BACK 5 TIMES
2062 026562  012767  026476  152320             MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
2063
2073                                    ;;*****************************************************************
                                        ;*TEST 43       TEST THAT PAR-PDR'S NOT AFFECTED BY RESET
                                        ;*
                                        ;*      THIS TEST CHECKS TO SEE THAT THE KERNEL,SUPERVISOR OR USER
                                        ;*      PAR/PDR'S ARE NOT AFFECTED BY THE EXECUTION OF A 'RESET''
                                        ;*      INSTRUCTION. ALL WRITEABLE BITS ARE SET TO A "1" IN THE
                                        ;*      PAR/PDR'S; THEY ARE THEN READ TO SEE THAT THEY REMAINED
                                        ;*      UNCHANGED.
                                        ;*
                                        ;;*****************************************************************
    026570  000004                      TST43:  SCOPE
2074
2075
2076 026572  012703  000020             1$:     MOV     #20,R3          ;LOAD LOOP COUNTER WITH A 16
2077 026576  012701  172300                     MOV     #KIPDR0,R1      ;LOAD FIRST ADDRESS OF PDR INTO R1
2078 026602  012702  172340                     MOV     #KIPAR0,R2      ;LOAD FIRST ADDRESS OF PAR INTO R2
2079 026606  012721  177777             21$:    MOV     #-1,(R1)+       ;SET BITS IN PDR TO 1'S
2080 026612  012722  177777                     MOV     #-1,(R2)+       ;SET BITS IN PAR'S TO 1'S
2081 026616  077305                             SOB     R3,21$          ;LOOP UNTIL ALL KERNAL PAR/PDR'S LOADED
2082 026620  012703  000020                     MOV     #20,R3          ;LOAD LOOP COUNTER WITH A 16
2083 026624  012701  172200                     MOV     #SIPDR0,R1      ;LOAD FIRST ADDRESS OF PDR INTO R1
2084 026630  012702  172240                     MOV     #SIPAR0,R2      ;LOAD FIRST ADDRESS OF PAR INTO R2
2085 026634  012721  177777             22$:    MOV     #-1,(R1)+       ;SET BITS IN PDR TO 1'S
2086 026640  012722  177777                     MOV     #-1,(R2)+       ;SET BITS IN PAR'S TO 1'S
```

```
2087 026644  077305                    SOB     R3,22$          ;LOOP UNTIL ALL SUPERVISOR PAR/PDR'S LOADED
2088 026646  012703  000020            MOV     #20,R3          ;LOAD LOOP COUNTER WITH A 16
2089 026652  012701  177600            MOV     #UIPDR0,R1      ;LOAD FIRST ADDRESS OF PDR INTO R1
2090 026656  012702  177640            MOV     #UIPAR0,R2      ;LOAD FIRST ADDRESS OF PAR INTO R2
2091 026662  012721  177777  23$:      MOV     #-1,(R1)+       ;SET BITS IN PDR TO 1'S
2092 026666  012722  177777            MOV     #-1,(R2)+       ;SET BITS IN PAR'S TO 1'S
2093 026672  077305                    SOB     R3,23$          ;LOOP UNTIL ALL USER PAR/PDR'S LOADED
2094 026674  000005                    RESET                   ;ISSUE AN ''INIT'' BY EXECUTING A RESET
2095 026676  012700  172300            MOV     #KIPDR0,R0      ;LOAD ADDRESS OF FIRST KERNEL PDR IN R0
```

```
2097 026702 012704 000020          MOV   #20,R4      ;LOAD LOOP COUNTER WITH A 16
2098 026706 011001          2$:    MOV   (R0),R1     ;READ A KERNEL PDR INTO R1
2099 026710 022701 177416          CMP   #177416,R1  ;ARE ALL THE BITS STILL SET?
2100 026714 001401                 BEQ   3$          ;BRANCH IF YES
2101 026716 104023                 ERROR +23         ;KERNEL PDR AFFECTED BY A RESET
2102                                                 ;FOR TIGHTER SCOPE LOOP
2103                                                 ;REPLACE ERROR CALL WITH
2104                                                 ;'BR 2$'' = 000773
2105 026720 062700 000002  3$:     ADD   #2,R0       ;FORM ADDRESS OF NEXT KERNEL PDR
2106 026724 077410                 SOB   R4,2$       ;LOOP TO 2$ UNTIL ALL KERNEL PDR'S CHECKED
2107 026726 012700 172340          MOV   #KIPAR0,R0  ;LOAD ADDRESS OF FIRST KERNEL PAR IN R0
2108 026732 012704 000020          MOV   #20,R4      ;LOAD LOOP COUNTER WITH A 16
2109 026736 011001          4$:    MOV   (R0),R1     ;READ A KERNEL PAR INTO R1
2110 026740 022701 177777          CMP   #177777,R1  ;ARE ALL THE BITS STILL SET?
2111 026744 001401                 BEQ   5$          ;BRANCH IF YES
2112 026746 104023                 ERROR +23         ;KERNEL PAR AFFECTED BY A RESET
2113                                                 ;FOR TIGHTER SCOPE LOOP
2114                                                 ;REPLACE ERROR CALL WITH
2115                                                 ;'BR 4$'' = 000773
2116 026750 062700 000002  5$:     ADD   #2,R0       ;FORM ADDRESS OF NEXT KERNEL PAR
2117 026754 077410                 SOB   R4,4$       ;LOOP TO 4$ UNTIL ALL KERNEL PAR'S CHECKED
2118
2119 026756 012700 172200          MOV   #SIPDR0,R0  ;LOAD ADDRESS OF FIRST SUPERVISOR PDR IN R0
2120 026762 012704 000020          MOV   #20,R4      ;LOAD LOOP COUNTER WITH A 16
2121 026766 011001          6$:    MOV   (R0),R1     ;READ A SUPERVISOR PDR INTO R1
2122 026770 022701 177416          CMP   #177416,R1  ;ARE ALL THE BITS STILL SET?
2123 026774 001401                 BEQ   7$          ;BRANCH IF YES
2124 026776 104023                 ERROR +23         ;SUPERVISOR PDR AFFECTED BY A RESET
2125                                                 ;FOR TIGHTER SCOPE LOOP
2126                                                 ;REPLACE ERROR CALL WITH
2127                                                 ;'BR 6$'' = 000773
2128 027000 062700 000002  7$:     ADD   #2,R0       ;FORM ADDRESS OF NEXT SUPERVISOR PDR
2129 027004 077410                 SOB   R4,6$       ;LOOP TO 6$ UNTIL ALL SUPERVISOR PDR'S CHECKED
2130
2131 027006 012700 172240          MOV   #SIPAR0,R0  ;LOAD ADDRESS OF FIRST SUPERVISOR PAR IN R0
2132 027012 012704 000020          MOV   #20,R4      ;LOAD LOOP COUNTER WITH A 16
2133 027016 011001          8$:    MOV   (R0),R1     ;READ A SUPERVISOR PAR INTO R1
2134 027020 022701 177777          CMP   #177777,R1  ;ARE ALL THE BITS STILL SET?
2135 027024 001401                 BEQ   9$          ;BRANCH IF YES
2136 027026 104023                 ERROR +23         ;SUPERVISOR PAR AFFECTED BY A RESET
2137                                                 ;FOR TIGHTER SCOPE LOOP
2138                                                 ;REPLACE ERROR CALL WITH
2139                                                 ;'BR 8$'' = 000773
2140 027030 062700 000002  9$:     ADD   #2,R0       ;FORM ADDRESS OF NEXT SUPERVISOR PAR
2141 027034 077410                 SOB   R4,8$       ;LOOP TO 8$ UNTIL ALL SUPERVISOR PAR'S CHECKED
2142
2143 027036 012700 177600          MOV   #UIPDR0,R0  ;LOAD ADDRESS OF FIRST USER PDR WITH R0
2144 027042 012704 000020          MOV   #20,R4      ;LOAD LOOP COUNTER WITH A 16
2145 027046 011001          10$:   MOV   (R0),R1     ;READ A USER PDR INTO R1
2146 027050 022701 177416          CMP   #177416,R1  ;ARE ALL THE BITS STILL SET?
2147 027054 001401                 BEQ   11$         ;BRANCH IF YES
2148 027056 104023                 ERROR +23         ;USER PDR AFFECTED BY A RESET
2149                                                 ;FOR TIGHTER SCOPE LOOP
2150                                                 ;REPLACE ERROR CALL WITH
2151                                                 ;'BR 10$'' = 000773
2152 027060 062700 000002  11$:    ADD   #2,R0       ;FORM ADDRESS OF NEXT USER PDR
2153 027064 077410                 SOB   R4,10$      ;LOOP TO 10$ UNTIL ALL USER PDR'S CHECKED
```

```
2154
2155 027066  012700  177640          MOV     #UIPAR0,R0      ;LOAD ADDRESS OF FIRST USER PAR IN R0
2156 027072  012704  000020          MOV     #20,R4          ;LOAD LOOP COUNTER WITH A 16
2157 027076  011001              12$:MOV     (R0),R1         ;READ A USER PAR INTO R1
2158 027100  022701  177777          CMP     #177777,R1      ;ARE ALL THE BITS STILL SET?
2159 027104  001401                  BEQ     13$             ;BRANCH IF YES
2160 027106  104023                  ERROR   +23             ;USER PAR AFFECTED BY A RESET
2161                                                         ;FOR TIGHTER SCOPE LOOP
2162                                                         ;REPLACE ERROR CALL WITH
2163                                                         ;'BR 12$' = 000773
2164 027110  062700  000002      13$:ADD     #2,R0           ;FORM ADDRESS OF NEXT USER PAR
2165 027114  077410                  SOB     R4,12$          ;LOOP TO 12$ UNTIL ALL USER PAR'S CHECKED
2166
2167
```

```
                                ;;*****************************************************************
                                ;*TEST 44       INST. FETCH NOT RELOCATED IN MAINT. MODE
                                ;*
                                ;*      THIS TEST CHECKS TO SEE THAT WHEN MEMORY MANAGEMENT IS IN
                                ;*      MAINTENANCE MODE (DESTINATION-ONLY-RELOCATION), AN INSTRUCTION
                                ;*      FETCH IS NOT RELOCATED AND A RESET CLEARS THE MAINTENANCE BIT
                                ;*      (BIT 08) IN SR0.  IF THE 'FETCH' IS RELOCATED, A PG.LENGTH ABORT
                                ;*      SHOULD OCCUR, CAUSING A HALT SINCE TRAP CATCHER IS PLACED IN VECTOR 250
                                ;*
                                ;*
                                ;*      NOTE:   A HALT MAY OCCUR IF MAINT. MODE NOT DISABLED BY RESET
                                ;*
                                ;;*****************************************************************
    027116  000004              TST44:  SCOPE
2182 027120  004767  153046     1$:     JSR     PC,TOFF         ;TURN T-BIT TRAPPING OFF FOR THIS TEST
2183 027124  012700  172300             MOV     #KIPDR0,R0      ;LOAD ADDRESS OF FIRST KERNEL PDR INTO R0
2184 027130  012704  000010             MOV     #10,R4          ;LOAD LOOP COUNTER WITH AN 8
2185 027134  005020             2$:     CLR     (R0)+           ;CLEAR PDR - MAPPING PAGE NON-RES, 0 BLKS.
2186 027136  077402                     SOB     R4,2$           ;LOOP TO 2$ UNTIL ALL KERNEL PDR'S CLEARED
2187 027140  012767  000252  151102     MOV     #MMVEC+2,MMVEC  ;LOAD TRAP CATCHER INTO MEM MGM. VECTOR
2188 027146  005067  151100             CLR     MMVEC+2         ;
2189                                                            ;A HALT WILL OCCUR IF RESET FAILS
2190                                                            ;TO DISABLE DEST.-ONLY RELOCATION
2191 027152  012767  001006  143120     MOV     #1006,KIPDR0    ;MAP KERNEL PG 0 R/W, 3 BLOCKS LONG.
2192 027160  012767  027166  151722     MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
2193 027166  012767  000400  150376  3$:  MOV     #BIT8,SR0       ;TURN ON DEST-ONLY-RELOCATION
2194 027174  000005                     RESET                   ;SHOULD CLEAR MAINT. BIT - WILL ABORT IF RELOCATED
2195 027176  032767  000400  150366     BIT     #BIT8,SR0       ;WAS MAINT. BIT (BIT 8) OF SR0 CLEARED?
2196 027204  001403                     BEQ     4$              ;BRANCH IF YES
2197 027206  005067  150360             CLR     SR0             ;CLEAR SR0 SO ERROR CAN BE REPORTED
2198 027212  104024                     ERROR   +24             ;MAINT. MODE NOT DISABLED BY A RESET
2199                                                            ;FOR A TIGHTER SCOPE LOOP
2200                                                            ;REPLACE ERROR CALL WITH
2201                                                            ;'BR 3$'' = 000765
2202 027214  012706  001100     4$:     MOV     #KERSTK,KSP     ;RESTORE STACK POINTER
2203 027220  005067  150346             CLR     SR0             ;BE SURE SR0 IS CLEAR
2204 027224  012767  003122  151016     MOV     #MGMERR,MMVEC   ;RESTORE MEM. MGMT. TRAP VECTOR
2205 027232  012767  000340  151012     MOV     #340,MMVEC+2    ;RESTORE MEM. MGMT VECTOR+2
2206 027240  012767  027120  151642     MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
2207 027246  004767  152754             JSR     PC,TON          ;TURN T-BIT TRAPPING BACK ON
2208
2222                            ;;*****************************************************************
                                ;*TEST 45       TEST THAT SOURCE NOT RELOCATED IN MAINT. MODE
                                ;*
                                ;*      THIS TEST CHECKS TO SEE THAT WHEN MEMORY MANAGEMENT IS IN
                                ;*      MAINTENANCE MODE, THE SOURCE IS NOT RELOCATED;  ONLY THE
                                ;*      DESTINATION IS RELOCATED.  KERNEL PAR'S 3 & 4 ARE MAPPED TO
                                ;*      PHYSICAL ADDRESS 60000-77776.  PDR4 IS SET TO ALLOW FULL
                                ;*      READ/WRITE BUT PDR3 IS CLEAR ALLOWING NO ACCESS.  VIRTUAL
                                ;*      ADDRESSES REFERENCING PAR/PDR'S 4 & 3 ARE USED AS
                                ;*      DESTINATION AND SOURCE RESPECTIVELY. IF THE SOURCE IS
                                ;*      RELOCATED IN MAINTENANCE MODE A MEM. MGMT. TRAP WILL OCCUR
                                ;*      AND THE ERROR WILL BE REPORTED.  KERNEL PG. 7 IS MAPPED R/W.
                                ;*
                                ;;*****************************************************************
    027252  000004              TST45:  SCOPE
2223 027254  004767  152712     1$:     JSR     PC,TOFF         ;TURN OFF T-BIT TRAPPING FOR THIS TEST
```

```
2224 027260  012767  027350  151622          MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
2225 027266  012767  000600  143052          MOV     #600,KIPAR3     ;MAP KERNAL PAGE 3 TO 12-16K
2226 027274  012767  000600  143046          MOV     #600,KIPAR4     ;MAP KERNAL PAGE 4 TO 12-16K
2227 027302  012767  007600  143046          MOV     #7600,KIPAR7    ;MAP KERNAL PAGE 7 TO THE I/O PAGE
2228 027310  005067  142772                  CLR     KIPDR3          ;MAP KERNAL PAGE 3 'NO ACCESS''
2229 027314  012767  077406  142766          MOV     #77406,KIPDR4   ;MAP KERNAL PAGE 4 R/W, 128 BLKS
2230 027322  012767  077406  142766          MOV     #77406,KIPDR7   ;MAP KERNAL PAGE 7 R/W, 128 BLKS
2231 027330  012767  027430  150712          MOV     #4$,MMVEC       ;SET M.M. VECTOR TO 4$ IN CASE OF ABORT
2232 027336  012737  000377  060000          MOV     #377,@#60000    ;LOAD ALL 1'S IN LOW BYTE OF TEST LOC.
2233 027344  012700  177777                  MOV     #-1,R0          ;LOAD EXPECTED CONTENTS OF TEST LOC. IN R0
2234 027350  052767  000400  150214  2$:     BIS     #BIT8,SR0       ;TURN ON DEST.-ONLY-RELOCATION
2235 027356  113737  060000  100001          MOVB    @#60000,@#100001;LOAD HI BYTE OF TEST LOC.-ABORT IF SOURCE RELOCATED
2236 027364  000005                          RESET                   ;TURN OFF DEST.-ONLY-RELOCATION
2237 027366  013701  060000                  MOV     @#60000,R1      ;READ CONTENTS OF TEST LOC.
2238 027372  020001                          CMP     R0,R1           ;WAS TEST LOCATION LOADED PROPERLY?
2239 027374  001401                          BEQ     3$              ;BRANCH IF YES
2240 027376  104025                          ERROR   +25             ;TEST LOC. NOT LOADED - INST. WAS ABORTED
2241                                                                 ;WHEN SOURCE WAS RELOCATED
2242                                                                 ;FOR TIGHTER SCOPE LOOP REPLACE
2243                                                                 ;ERROR CALL WITH
2244                                                                 ;'BR 2$'' = 000764
2245 027400  012767  003122  150642  3$:     MOV     #MGMERR,MMVEC   ;RESTORE MEM. MGMT. VECTOR
2246 027406  012767  077406  142672          MOV     #77406,KIPDR3   ;MAP KERNAL PAGE 3 R/W, 128 BLKS
2247 027414  012767  027254  151466          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
2248 027422  004767  152600                  JSR     PC,TON          ;TURN T-BIT TRAPPING BACK ON
2249 027426  000430                          BR      TST46           ;;SKIP TO NEXT TEST
2250                              ;*  IF THE PROGRAM TRIES TO RELOCATE THE SOURCE, IT SHOULD TRAP TO 4$
2251
2252 027430  042767  000400  150134  4$:     BIC     #BIT8,SR0       ;TURN OFF DEST.-ONLY-RELOCATION THRU PAR/PDR 7
2253 027436  016767  150130  151620          MOV     SR0,WASSR0      ;SAVE REST OF SR0 CONTENTS
2254 027444  016767  150126  151616          MOV     SR2,WASSR2      ;SAVE CONTENTS OF SR2
2255 027452  010667  151600                  MOV     SP,WASR6        ;SAVE VALUE OF THE STACK POINTER
2256 027456  012667  151576                  MOV     (SP)+,TRAPPC    ;SAVE PC OF TRAP
2257 027462  012667  151574                  MOV     (SP)+,TRAPPS    ;SAVE PSW OF TRAP
2258 027466  042767  160000  150076          BIC     #160000,SR0     ;CLEAR ERROR BITS IN SR0
2259 027474  104026                          ERROR   +26             ;SOURCE APPARENTLY RELOCATED IN MAINT. MODE
2260                                                                 ;FOR TIGHTER SCOPE LOOP
2261                                                                 ;REPLACE ERROR CALL WITH A
2262                                                                 ;'NOP'' = 000240
2263 027476  016746  151560                  MOV     TRAPPS,-(SP)    ;PUT PSW OF TRAP BACK ON THE STACK
2264 027502  016746  151552                  MOV     TRAPPC,-(SP)    ;PUT PC OF TRAP BACK ON THE STACK
2265 027506  000002                          RTI                     ;RETURN TO TEST
```

```
                                ;/.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\
                                .SBTTL  GROUP 3              ADDER TESTS
                                ;/.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\


                                ;;*****************************************************************
                                ;*TEST 46       18-BIT MAPPING ADDER TEST
                                ;*
                                ;*      THIS TEST  USES 'DESTINATION ONLY'  RELOCATION TO CHECK THE
                                ;*      FULL ADD  PROPERTIES OF  THE RELOCATION ADDER. TWELVE PAIRS
                                ;*      OF NUMBERS ARE ADDED, GENERTING PHYSICAL ADDRESSES FROM 12K
                                ;*      TO ABOVE 16K.
                                ;*
                                ;*      NOTE - PART OF THIS TEST WILL NOT BE RUN IF THERE IS LESS
                                ;*             THAN 16K OF MEMORY ON THE SYSTEM.
                                ;*
                                ;;*****************************************************************
027510  000004                  TST46:  SCOPE
                                ;       THE FOLLOWING CODE CLEARS ALL THE PAR'S AND PDR'S SO THAT
                                ;       THE RELOCATION ADDERS CAN BE CHECKED. ONLY THE KERNAL
                                ;       I-SPACE PAR'S AND PDR'S WILL BE MAPPED RESIDENT AND R/W.
027512  012705  172340                  MOV     #KIPAR0,R5      ;PUT ADDRESS OF FIRST PAR IN R5
027516  004767  152536                  JSR     PC,CLRREG       ;CLEAR KERNAL PAR'S
027522  012705  172300                  MOV     #KIPDR0,R5      ;PUT ADDRESS OF FIRST PDR IN R5
027526  004767  152526                  JSR     PC,CLRREG       ;CLEAR KERNAL PDR'S
027532  012705  172240                  MOV     #SIPAR0,R5      ;PUT ADDRESS OF FIRST PAR IN R5
027536  004767  152516                  JSR     PC,CLRREG       ;CLEAR SUPERVISOR PAR'S
027542  012705  172200                  MOV     #SIPDR0,R5      ;PUT ADDRESS OF FIRST PDR IN R5
027546  004767  152506                  JSR     PC,CLRREG       ;CLEAR SUPERVISOR PDR'S
027552  012705  177640                  MOV     #UIPAR0,R5      ;PUT ADDRESS OF FIRST PAR IN R5
027556  004767  152476                  JSR     PC,CLRREG       ;CLEAR USER PAR'S
027562  012705  177600                  MOV     #UIPDR0,R5      ;PUT ADDRESS OF FIRST PDR IN R5
027566  004767  152466                  JSR     PC,CLRREG       ;CLEAR USER PDR'S
027572  012700  077406          40$:    MOV     #77406,R0       ;MAKE KERNAL I-SPACE PDR'S 4K,R/W,UPWARD
027576  012702  000010                  MOV     #10,R2          ;SET COUNTER TO LOAD 8 ADDRESSES
027602  012701  172300                  MOV     #KIPDR0,R1      ;PUT ADDRESS OF FIRST PDR IN R1
027606  010021          41$:    MOV     R0,(R1)+        ;LOAD R0 INTO PDR ADDRESSED BY R1
027610  077202                  SOB     R2,41$          ;BRANCH BACK TO 41$ IF R2 IS NOT ZERO
027612  012767  000000  142520        MOV     #000,KIPAR0     ;MAP PAGE 0 TO 0->4K
027620  012767  000200  142514        MOV     #200,KIPAR1     ;MAP PAGE 1 TO 4K->8K
027626  012767  000400  142510        MOV     #400,KIPAR2     ;MAP PAGE 2 TO 8K->12K
027634  012767  000600  142504        MOV     #600,KIPAR3     ;MAP PAGE 3 TO 12K->16K
027642  012767  177600  142506        MOV     #177600,KIPAR7  ;MAP PAGE 7 TO I/O PAGE
027650  012767  027702  151232        MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
027656  013767  060000  151312        MOV     @#60000,$TMP0   ;SAVE DATA AT TEST LOCATION
027664  012737  000600  172350        MOV     #600,@#KIPAR4   ;LOAD PAR4 WITH 600
027672  012700  100000                MOV     #100000,R0      ;PUT VIRTUAL ADDRESS IN R0
027676  012701  125200                MOV     #125200,R1      ;PUT DATA PATTERN INTO R1
027702  052737  000400  177572  1$:   BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
027710  010110                  MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 100000
027712  013702  060000                MOV     @#60000,R2      ;READ (60000) INTO R2
027716  000005                  RESET                   ;CLEAR MMR0
027720  020102                  CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
027722  001401                  BEQ     2$              ;BRANCH IF DATA MATCHES
027724  104017                  ERROR   +17             ;RELOCATION FAILED
027726  016737  151244  060000  2$:    MOV     $TMP0,@#60000   ;RESTORE ORIGINAL DATA TO TEST LOCATION
```

```
                                                MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
                                                MOV     @#67776,$TMP0   ;SAVE DATA AT TEST LOCATION
                                                MOV     #625,@#KIPAR4   ;LOAD PAR4 WITH 625
                                                MOV     #105276,R0      ;PUT VIRTUAL ADDRESS IN R0
                                                MOV     #125201,R1      ;PUT DATA PATTERN INTO R1
027766 052737 000400 177572             3$:     BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
027774 010110                                   MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 105276
027776 013702 067776                            MOV     @#67776,R2      ;READ (67776) INTO R2
030002 000005                                   RESET                   ;CLEAR MMR0
030004 020102                                   CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
030006 001401                                   BEQ     4$              ;BRANCH IF DATA MATCHES
030010 104017                                   ERROR   +17             ;RELOCATION FAILED
030012 016737 151160 067776             4$:     MOV     $TMP0,@#67776   ;RESTORE ORIGINAL DATA TO TEST LOCATION
2312 030020 012767 030052 151062                MOV     #5$,$LPERR      ;SET LOOP ON ERROR POINTER TO 5$
030026 013767 071000 151142                     MOV     @#71000,$TMP0   ;SAVE DATA AT TEST LOCATION
030034 012737 000633 172350                     MOV     #633,@#KIPAR4   ;LOAD PAR4 WITH 633
030042 012700 105500                            MOV     #105500,R0      ;PUT VIRTUAL ADDRESS IN R0
030046 012701 125202                            MOV     #125202,R1      ;PUT DATA PATTERN INTO R1
030052 052737 000400 177572             5$:     BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
C30060 010110                                   MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 105500
030062 013702 071000                            MOV     @#71000,R2      ;READ (71000) INTO R2
030066 000005                                   RESET                   ;CLEAR MMR0
030070 020102                                   CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
030072 001401                                   BEQ     6$              ;BRANCH IF DATA MATCHES
030074 104017                                   ERROR   +17             ;RELOCATION FAILED
030076 016737 151074 071000             6$:     MOV     $TMP0,@#71000   ;RESTORE ORIGINAL DATA TO TEST LOCATION
2313 030104 012767 030136 150776                MOV     #7$,$LPERR      ;SET LOOP ON ERROR POINTER TO 7$
030112 013767 072076 151056                     MOV     @#72076,$TMP0   ;SAVE DATA AT TEST LOCATION
030120 012737 000604 172350                     MOV     #604,@#KIPAR4   ;LOAD PAR4 WITH 604
030126 012700 111476                            MOV     #111476,R0      ;PUT VIRTUAL ADDRESS IN R0
030132 012701 125203                            MOV     #125203,R1      ;PUT DATA PATTERN INTO R1
030136 052737 000400 177572             7$:     BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
030144 010110                                   MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 111476
030146 013702 072076                            MOV     @#72076,R2      ;READ (72076) INTO R2
030152 000005                                   RESET                   ;CLEAR MMR0
030154 020102                                   CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
030156 001401                                   BEQ     8$              ;BRANCH IF DATA MATCHES
030160 104017                                   ERROR   +17             ;RELOCATION FAILED
030162 016737 151010 072076             8$:     MOV     $TMP0,@#72076   ;RESTORE ORIGINAL DATA TO TEST LOCATION
2314 030170 026727 152626 001000                CMP     $LSTBK,#1000    ;DO WE HAVE OVER 16K ON THIS SYSTEM?
2315 030176 003002                              BGT     9$              ;BRANCH IF WE DO
2316 030200 000167 001166                       JMP     APTTST          ;JUMP TO THE NEXT TEST IF WE DO NOT
2317 030204                             9$:
030204 012767 030236 150676                     MOV     #11$,$LPERR     ;SET LOOP ON ERROR POINTER TO 11$
030212 013767 100000 150756                     MOV     @#100000,$TMP0  ;SAVE DATA AT TEST LOCATION
030220 012737 001000 172350                     MOV     #1000,@#KIPAR4  ;LOAD PAR4 WITH 1000
030226 012700 100000                            MOV     #100000,R0      ;PUT VIRTUAL ADDRESS IN R0
030232 012701 125204                            MOV     #125204,R1      ;PUT DATA PATTERN INTO R1
030236 052737 000400 177572             11$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
030244 010110                                   MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 100000
030246 013702 100000                            MOV     @#100000,R2     ;READ (100000) INTO R2
030252 000005                                   RESET                   ;CLEAR MMR0
030254 020102                                   CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
030256 001401                                   BEQ     12$             ;BRANCH IF DATA MATCHES
030260 104017                                   ERROR   +17             ;RELOCATION FAILED
030262 016737 150710 100000             12$:    MOV     $TMP0,@#100000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
2318 030270 012767 030322 150612                MOV     #13$,$LPERR     ;SET LOOP ON ERROR POINTER TO 13$
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                030276  013767  137776  150672          MOV     @#137776,$TMP0  ;SAVE DATA AT TEST LOCATION
                030304  012737  001252  172350          MOV     #1252,@#KIPAR4  ;LOAD PAR4 WITH 1252
                030312  012700  112576                  MOV     #112576,R0      ;PUT VIRTUAL ADDRESS IN R0
                030316  012701  125205                  MOV     #125205,R1      ;PUT DATA PATTERN INTO R1
                030322  052737  000400  177572  13$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                030330  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 112576
                030332  013702  137776                  MOV     @#137776,R2     ;READ (137776) INTO R2
                030336  000005                          RESET                   ;CLEAR MMR0
                030340  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                030342  001401                          BEQ     14$             ;BRANCH IF DATA MATCHES
                030344  104017                          ERROR   +17             ;RELOCATION FAILED
                030346  016737  150624  137776  14$:    MOV     $TMP0,@#137776  ;RESTORE ORIGINAL DATA TO TEST LOCATION
     2319       030354  012767  030406  150526          MOV     #15$,$LPERR     ;SET LOOP ON ERROR POINTER TO 15$
                030362  013767  117776  150606          MOV     @#117776,$TMP0  ;SAVE DATA AT TEST LOCATION
                030370  012737  001125  172350          MOV     #1125,@#KIPAR4  ;LOAD PAR4 WITH 1125
                030376  012700  105276                  MOV     #105276,R0      ;PUT VIRTUAL ADDRESS IN R0
                030402  012701  125206                  MOV     #125206,R1      ;PUT DATA PATTERN INTO R1
                030406  052737  000400  177572  15$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                030414  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 105276
                030416  013702  117776                  MOV     @#117776,R2     ;READ (117776) INTO R2
                030422  000005                          RESET                   ;CLEAR MMR0
                030424  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                030426  001401                          BEQ     16$             ;BRANCH IF DATA MATCHES
                030430  104017                          ERROR   +17             ;RELOCATION FAILED
                030432  016737  150540  117776  16$:    MOV     $TMP0,@#117776  ;RESTORE ORIGINAL DATA TO TEST LOCATION
     2320       030440  012767  030472  150442          MOV     #17$,$LPERR     ;SET LOOP ON ERROR POINTER TO 17$
                030446  013767  102000  150522          MOV     @#102000,$TMP0  ;SAVE DATA AT TEST LOCATION
                030454  012737  001010  172350          MOV     #1010,@#KIPAR4  ;LOAD PAR4 WITH 1010
                030462  012700  101000                  MOV     #101000,R0      ;PUT VIRTUAL ADDRESS IN R0
                030466  012701  125207                  MOV     #125207,R1      ;PUT DATA PATTERN INTO R1
                030472  052737  000400  177572  17$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                030500  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 101000
                030502  013702  102000                  MOV     @#102000,R2     ;READ (102000) INTO R2
                030506  000005                          RESET                   ;CLEAR MMR0
                030510  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                030512  001401                          BEQ     18$             ;BRANCH IF DATA MATCHES
                030514  104017                          ERROR   +17             ;RELOCATION FAILED
                030516  016737  150454  102000  18$:    MOV     $TMP0,@#102000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
     2321       030524  012767  030556  150356          MOV     #19$,$LPERR     ;SET LOOP ON ERROR POINTER TO 19$
                030532  013767  142000  150436          MOV     @#142000,$TMP0  ;SAVE DATA AT TEST LOCATION
                030540  012737  001314  172350          MOV     #1314,@#KIPAR4  ;LOAD PAR4 WITH 1314
                030546  012700  110400                  MOV     #110400,R0      ;PUT VIRTUAL ADDRESS IN R0
                030552  012701  125210                  MOV     #125210,R1      ;PUT DATA PATTERN INTO R1
                030556  052737  000400  177572  19$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                030564  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 110400
                030566  013702  142000                  MOV     @#142000,R2     ;READ (142000) INTO R2
                030572  000005                          RESET                   ;CLEAR MMR0
                030574  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                030576  001401                          BEQ     20$             ;BRANCH IF DATA MATCHES
                030600  104017                          ERROR   +17             ;RELOCATION FAILED
                030602  016737  150370  142000  20$:    MOV     $TMP0,@#142000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
     2322       030610  012767  030642  150272          MOV     #21$,$LPERR     ;SET LOOP ON ERROR POINTER TO 21$
                030616  013767  122000  150352          MOV     @#122000,$TMP0  ;SAVE DATA AT TEST LOCATION
                030624  012737  001104  172350          MOV     #1104,@#KIPAR4  ;LOAD PAR4 WITH 1104
                030632  012700  111400                  MOV     #111400,R0      ;PUT VIRTUAL ADDRESS IN R0
                030636  012701  125211                  MOV     #125211,R1      ;PUT DATA PATTERN INTO R1
                030642  052737  000400  177572  21$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
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                030650  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 111400
                030652  013702  122000                  MOV     @#122000,R2     ;READ (122000) INTO R2
                030656  000005                          RESET                   ;CLEAR MMR0
                030660  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                030662  001401                          BEQ     22$             ;BRANCH IF DATA MATCHES
                030664  104017                          ERROR   +17             ;RELOCATION FAILED
                030666  016737  150304  122000  22$:    MOV     $TMP0,@#122000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
   2323         030674  012767  030726  150206          MOV     #23$,$LPERR     ;SET LOOP ON ERROR POINTER TO 23$
                030702  013767  142000  150266          MOV     @#142000,$TMP0  ;SAVE DATA AT TEST LOCATION
                030710  012737  001356  172350          MOV     #1356,@#KIPAR4  ;LOAD PAR4 WITH 1356
                030716  012700  104200                  MOV     #104200,R0      ;PUT VIRTUAL ADDRESS IN R0
                030722  012701  125212                  MOV     #125212,R1      ;PUT DATA PATTERN INTO R1
                030726  052737  000400  177572  23$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                030734  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 104200
                030736  013702  142000                  MOV     @#142000,R2     ;READ (142000) INTO R2
                030742  000005                          RESET                   ;CLEAR MMR0
                030744  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                030746  001401                          BEQ     24$             ;BRANCH IF DATA MATCHES
                030750  104017                          ERROR   +17             ;RELOCATION FAILED
                030752  016737  150220  142000  24$:    MOV     $TMP0,@#142000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
   2324         030760  012767  031012  150122          MOV     #25$,$LPERR     ;SET LOOP ON ERROR POINTER TO 25$
                030766  013767  142000  150202          MOV     @#142000,$TMP0  ;SAVE DATA AT TEST LOCATION
                030774  012737  001242  172350          MOV     #1242,@#KIPAR4  ;LOAD PAR4 WITH 1242
                031002  012700  115600                  MOV     #115600,R0      ;PUT VIRTUAL ADDRESS IN R0
                031006  012701  125213                  MOV     #125213,R1      ;PUT DATA PATTERN INTO R1
                031012  052737  000400  177572  25$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                031020  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 115600
                031022  013702  142000                  MOV     @#142000,R2     ;READ (142000) INTO R2
                031026  000005                          RESET                   ;CLEAR MMR0
                031030  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                031032  001401                          BEQ     26$             ;BRANCH IF DATA MATCHES
                031034  104017                          ERROR   +17             ;RELOCATION FAILED
                031036  016737  150134  142000  26$:    MOV     $TMP0,@#142000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
   2325         031044  012767  031076  150036          MOV     #27$,$LPERR     ;SET LOOP ON ERROR POINTER TO 27$
                031052  013767  142000  150116          MOV     @#142000,$TMP0  ;SAVE DATA AT TEST LOCATION
                031060  012737  001377  172350          MOV     #1377,@#KIPAR4  ;LOAD PAR4 WITH 1377
                031066  012700  102100                  MOV     #102100,R0      ;PUT VIRTUAL ADDRESS IN R0
                031072  012701  125214                  MOV     #125214,R1      ;PUT DATA PATTERN INTO R1
                031076  052737  000400  177572  27$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                031104  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 102100
                031106  013702  142000                  MOV     @#142000,R2     ;READ (142000) INTO R2
                031112  000005                          RESET                   ;CLEAR MMR0
                031114  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                031116  001401                          BEQ     28$             ;BRANCH IF DATA MATCHES
                031120  104017                          ERROR   +17             ;RELOCATION FAILED
                031122  016737  150050  142000  28$:    MOV     $TMP0,@#142000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
   2326         031130  012767  031162  147752          MOV     #29$,$LPERR     ;SET LOOP ON ERROR POINTER TO 29$
                031136  013767  142000  150032          MOV     @#142000,$TMP0  ;SAVE DATA AT TEST LOCATION
                031144  012737  001221  172350          MOV     #1221,@#KIPAR4  ;LOAD PAR4 WITH 1221
                031152  012700  117700                  MOV     #117700,R0      ;PUT VIRTUAL ADDRESS IN R0
                031156  012701  125215                  MOV     #125215,R1      ;PUT DATA PATTERN INTO R1
                031162  052737  000400  177572  29$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
                031170  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 117700
                031172  013702  142000                  MOV     @#142000,R2     ;READ (142000) INTO R2
                031176  000005                          RESET                   ;CLEAR MMR0
                031200  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
                031202  001401                          BEQ     30$             ;BRANCH IF DATA MATCHES
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        031204  104017                          ERROR   +17             ;RELOCATION FAILED
        031206  016737  147764  142000  30$:    MOV     $TMP0,@#142000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
 2327   031214  012767  031246  147666          MOV     #31$,$LPERR     ;SET LOOP ON ERROR POINTER TO 31$
        031222  013767  140000  147746          MOV     @#140000,$TMP0  ;SAVE DATA AT TEST LOCATION
        031230  012737  001377  172350          MOV     #1377,@#KIPAR4  ;LOAD PAR4 WITH 1377
        031236  012700  100100                  MOV     #100100,R0      ;PUT VIRTUAL ADDRESS IN R0
        031242  012701  125216                  MOV     #125216,R1      ;PUT DATA PATTERN INTO R1
        031246  052737  000400  177572  31$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
        031254  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 100100
        031256  013702  140000                  MOV     @#140000,R2     ;READ (140000) INTO R2
        031262  000005                          RESET                   ;CLEAR MMR0
        031264  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
        031266  001401                          BEQ     32$             ;BRANCH IF DATA MATCHES
        031270  104017                          ERROR   +17             ;RELOCATION FAILED
        031272  016737  147700  140000  32$:    MOV     $TMP0,@#140000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
 2328   031300  012767  031332  147602          MOV     #33$,$LPERR     ;SET LOOP ON ERROR POINTER TO 33$
        031306  013767  140000  147662          MOV     @#140000,$TMP0  ;SAVE DATA AT TEST LOCATION
        031314  012737  001370  172350          MOV     #1370,@#KIPAR4  ;LOAD PAR4 WITH 1370
        031322  012700  101000                  MOV     #101000,R0      ;PUT VIRTUAL ADDRESS IN R0
        031326  012701  125217                  MOV     #125217,R1      ;PUT DATA PATTERN INTO R1
        031332  052737  000400  177572  33$:    BIS     #BIT8,@#MMR0    ;TURN ON DESTINATION ONLY RELOCATION
        031340  010110                          MOV     R1,(R0)         ;TRY TO LOAD DATA PATTERN INTO 101000
        031342  013702  140000                  MOV     @#140000,R2     ;READ (140000) INTO R2
        031346  000005                          RESET                   ;CLEAR MMR0
        031350  020102                          CMP     R1,R2           ;SEE IF DATA MATCHES PATTERN
        031352  001401                          BEQ     34$             ;BRANCH IF DATA MATCHES
        031354  104017                          ERROR   +17             ;RELOCATION FAILED
        031356  016737  147614  140000  34$:    MOV     $TMP0,@#140000  ;RESTORE ORIGINAL DATA TO TEST LOCATION
 2329   031364  012767  027572  147516          MOV     #40$,$LPERR     ;SET LOOP ON ERROR POINTER TO 40$
 2330
 2331                                   ;*************************************************************************
 2332                                   ;* THIS PIECE OF CODE CHECKS TO SEE IF THE PROGRAM IS RUNNING UNDER
 2333                                   ;* APT, AND THEN LOOKS FOR THE APT SPECIAL ADDRESSING HARDWARE. IF
 2334                                   ;* THE HARDWARE IS FOUND, THE NEXT TWO TESTS OPERATE AS IF THERE
 2335                                   ;* WERE A FULL COMPLEMENT OF MEMORY ON THE SYSTEM.
 2336                                   ;*************************************************************************
 2337   031372  005067  147742          APTTST: CLR     HDWFLAG         ;RESET THE HARDWARE PRESENT FLAG
 2338   031376  105767  147642                  TSTB    $ENV            ;ARE WE UNDER APT?
 2339   031402  001002                          BNE     1$              ;BRANCH IF WE ARE
 2340   031404  000167  000042                  JMP     TST47           ;ELSE GO TO TEST 47
 2341   031410  032767  000200  147632  1$:     BIT     #BIT7,$USWR     ;IS THE HARDWARE SUPPOSED TO BE THERE?
 2342   031416  001002                          BNE     2$              ;BRANCH IF TRUE
 2343   031420  000167  000026                  JMP     TST47           ;ELSE GO TO TEST 47
 2344   031424  012767  031440  146352  2$:     MOV     #3$,ERRVEC      ;TRAPS TO 4 GO TO 3$
 2345   031432  005767  146332                  TST     RMIREG          ;SPECIAL HARDWARE PRESENT?
 2346   031436  000403                          BR      4$              ;IF WE GOT HERE, THE HARDWARE IS THERE
 2347   031440  104060                  3$:     ERROR   +60             ;APT SPECIAL HARDWARE NOT FOUND
 2348   031442  000167  000004                  JMP     TST47           ;GO TO TEST 47
 2349   031446  005267  147666          4$:     INC     HDWFLAG         ;SET SPECIAL HARDWARE PRESENT FLAG
 2350
 2365                                   ;;*************************************************************************
                                        ;*TEST 47        18-BIT MAPPING CARRY PROPAGATION
                                        ;*
                                        ;*      THIS TEST USES FULL 18-BIT RELOCATION TO CHECK THE CARRY
                                        ;*      PROPAGATION OF THE RELOCATION ADDER.  SINCE THIS TEST SCANS
                                        ;*      MEMORY FROM 00100000 TO 00740000 ON 8K BOUNDARIES, IT WILL
                                        ;*      REPORT ANY HOLES THAT IT FINDS IN MEMORY UP TO THE LAST
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                                ;*      BLOCK.  THE INFORMATION GIVEN WILL BE THE ADDRESS WHERE
                                ;*      THE HOLE WAS DISCOVERED AND THE FIRST GOOD ADDRESS AFTER
                                ;*      THE HOLE.
                                ;*
                                ;*      NOTE - PART OF THIS TEST WILL NOT BE RUN IF THE SYSTEM
                                ;*             MEMORY SIZE IS LESS THAN 16K WORDS.
                                ;*
                                ;*************************************************************************
031452  000004                TST47:  SCOPE
2366
2367 031454  012700  100100          MOV     #100100,R0      ;LOAD VIRTUAL ADDR FOR PAR4 INTO R0
2368 031460  012737  000001  177572  MOV     #1,@#MMR0       ;TURN ON 18-BIT MAPPING
2369 031466  005767  147646          TST     HDWFLAG         ;SPECIAL HARDWARE?
2370 031472  001004                BNE     20$             ;BRANCH IF TRUE
2371 031474  026727  151322  001000  CMP     $LSTBK,#1000    ;IS THERE AT LEAST 16K ON THE SYSTEM?
2372 031502  002510                BLT     4$              ;BRANCH IF LESS THAN 16K TO 4$
2373 031504  005067  147626        20$:    CLR     HOLFLG          ;MAKE SURE HOLE FLAG STARTS AT ZERO
2374 031510  012767  032146  146266  MOV     #10$,ERRVEC     ;SET ERROR VECTOR POINTER TO 10$
2375 031516  012767  000777  140624  MOV     #777,KIPAR4     ;LOAD PAR4 WITH STARTING BASE
2376 031524  012767  001000  140620  MOV     #1000,KIPAR5    ;START ADDRESSING WITH 16K
2377 031532  012701  120000          MOV     #120000,R1      ;LOAD VIRTUAL ADDR FOR PAR5 INTO R1
2378 031536  012702  000375          MOV     #375,R2         ;LOAD DATA PATTERN INTO R2
2379 031542  012767  031550  147340  MOV     #1$,$LPERR      ;SET LOOP ON ERROR POINTER TO 1$
2380 031550  005067  147556        1$:     CLR     PCPUER          ;CLEAR CPU ERROR FLAG
2381 031554  005767  147560          TST     HDWFLAG         ;SPECIAL HARDWARE?
2382 031560  001404                BEQ     2$              ;BRANCH IF FALSE
2383 031562  026767  140564  151232  CMP     KIPAR5,$LSTBK   ;ARE WE OUT OF EXISTING MEMORY?
2384 031570  003023                BGT     21$             ;BRANCH IF TRUE
2385 031572  011167  147400        2$:     MOV     (R1),$TMP0      ;SAVE DATA AT TEST LOCATION
2386 031576  005767  147530          TST     PCPUER          ;SEE IF THERE WAS A CPU TRAP
2387 031602  001014                BNE     3$              ;BRANCH IF TRAP OCCURRED
2388 031604  005767  147526          TST     HOLFLG          ;SEE IF HOLE WAS FOUND IN MEMORY
2389 031610  001411                BEQ     3$              ;BRANCH IF NO HOLE WAS FOUND
2390 031612  016767  140534  147362  MOV     KIPAR5,$TMP2    ;SAVE PAR THAT POINTS TO END OF HOLE
2391 031620  012767  031504  147262  MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO 20$
2392 031626  104041                ERROR   +41             ;HOLE IN MEMORY FROM $TMP1 TO $TMP2
2393 031630  005067  147502          CLR     HOLFLG          ;CLEAR HOLE FLAG IN CASE THERE ARE MORE
2394 031634  010210        3$:     MOV     R2,(R0)         ;LOAD TEST PATTERN INTO TEST LOCATION
2395 031636  000405                BR      23$             ;BRANCH OVER NEXT INSTRUCTIONS
2396 031640  010204        21$:    MOV     R2,R4           ;GET COPY OF DATA
2397 031642  052704  000400          BIS     #BIT8,R4        ;ADD SPECIAL HARDWARE ENABLE BIT
2398 031646  010467  146116          MOV     R4,RMIREG       ;PUT DATA IN SPECIAL HARDWARE
2399 031652  011103        23$:    MOV     (R1),R3         ;READ TEST LOCATION VIA DIFFERENT VIRT. ADDR.
2400 031654  020203                CMP     R2,R3           ;SEE IF THE CORRECT LOCATION WAS REFERENCED
2401 031656  001401                BEQ     22$             ;BRANCH IF CORRECT DATA WAS OBTAINED
2402 031660  104042                ERROR   +42             ;BAD RELOCATION
2403 031662  016711  147310        22$:    MOV     $TMP0,(R1)      ;RESTORE ORIGINAL DATA TO TEST LOCATION
2404 031666  062767  000400  140454  ADD     #400,KIPAR4     ;CHANGE BASE ADDRESS
2405 031674  062767  000400  140450  ADD     #400,KIPAR5     ;CHANGE BASE ADDRESS
2406 031702  005302                DEC     R2              ;CHANGE DATA PATTERN
2407 031704  022767  007400  140440  CMP     #7400,KIPAR5    ;SEE IF PAST LAST ADDRESS
2408 031712  103316                BHIS    1$              ;BRANCH IF NOT PAST LAST ADDRESS
2409 031714  005767  147416          TST     HOLFLG          ;SEE IF YOU ARE IN MIDDLE OF HOLE
2410 031720  001401                BEQ     4$              ;BRANCH IF NOT IN MIDDLE OF HOLE
2411 031722  104043                ERROR   +43             ;IN MIDDLE OF HOLE IN MEMORY
2412                                                        ;HOLFLG HAS NUMBER OF TIMEOUTS
2413                                                        ;$TMP1 HAS PAR OF FIRST TIMEOUT
```

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                                        ;*
                                        ;*      ADDRESS 760000 IS GENERATED BY CARRY PROPAGATION WHILE THE
                                        ;*      PROGRAM IS EXPECTING A TIME OUT.  (760000 IS THE FIRST I/O
                                        ;*      PAGE ADDRESS).  KIPAR4 WILL CONTAIN 007577 AND R0 HAS 100100
                                        ;*      (WHICH SELECTS KIPAR4 AND GENERATES ADDRESS 760000).  IF THE
                                        ;*      WRONG BIT IN THE CPU ERROR REGISTER IS SET, OR IF NO TRAP
                                        ;*      TO 'ERRVEC' OCCURS AN ERROR IS REPORTED.
                                        ;*
031724  005767  147410          4$:   TST     HDWFLAG         ;SPECIAL HARDWARE?
031730  001402                        BEQ     45$             ;BRANCH IF NOT
031732  005067  146032                CLR     RMIREG          ;MAKE SURE SPECIAL HARDWAE IS OFF
031736  012767  003024  146040  45$:  MOV     #TIMERR,ERRVEC  ;RESTORE NORMAL ROUTINE FOR TRAPS THRU 4
031744  012767  031776  147136        MOV     #40$,$LPERR     ;SET LOOP ON ERROR POINTER TO 40$
031752  012767  007577  140370        MOV     #7577,KIPAR4    ;LOAD KIPAR4 WITH 007577
031760  012702  007600                MOV     #7600,R2        ;LOAD DATA PATTERN INTO R2
031764  012767  000020  147342        MOV     #20,CPUEXP      ;EXPECTING UNIBUS TIMEOUT
031772  005067  147334                CLR     PCPUER          ;CLEAR CPU TRAP FLAG
031776  010210                  40$:  MOV     R2,(R0)         ;LOAD 760000 THRU PAGE 4
                                                              ;THIS INSTRUCTION SHOULD TIMEOUT
                                                              ;OVER THE UNIBUS.
032000  005767  147326                TST     PCPUER          ;SEE IF TRAP OCCURRED
032004  001001                        BNE     6$              ;BRANCH IF TRAP
032006  104044                        ERROR   +44             ;NO CPU TRAP
                                        ;*
                                        ;*      ADDRESS 000000 IS GENERATED BY CARRY PROPAGATION.  THEN, IF
                                        ;*      THERE IS LESS THAN 120K OF MEMORY ON THE SYSTEM, THE LAST
                                        ;*      BLOCK ($LSTBK) IS USED AS A PAR AND A CARRY IS PROPAGATED TO
                                        ;*      CAUSE AN 18-BIT OVERFLOW.
                                        ;*
032010  012767  032034  147072  6$:   MOV     #16$,$LPERR     ;SET LOOP ON ERROR POINTER TO 16$
032016  005067  147312                CLR     CPUEXP          ;NO TRAPS THRU ERRVEC EXPECTED HERE
032022  012767  007777  140320        MOV     #7777,KIPAR4    ;LOAD PAR4 WITH HIGHEST VALUE POSSIBLE
032030  005037  000000                CLR     @#000000        ;CLEAR ADDRESS ZERO
032034  013701  100100          16$:  MOV     @#100100,R1     ;THIS SHOULD READ ADDRESS ZERO INTO R1
032040  005701                        TST     R1              ;SEE IF YOU READ ADDRESS ZERO
032042  001401                        BEQ     7$              ;BRANCH IF ADDRESS ZERO WAS READ
032044  104045                        ERROR   +45             ;DIDN'T READ ADDRESS ZERO
032046  012767  032112  147034  7$:   MOV     #17$,$LPERR     ;SET LOOP ON ERROR POINTER TO 17$
032054  022767  007377  150740        CMP     #7377,$LSTBK    ;IS MEMORY BLOCK SIZE < 7377
032062  101423                        BLOS    8$              ;BRANCH IF MORE THAT 120K ON SYSTEM
032064  012767  000040  147242        MOV     #40,CPUEXP      ;EXPECTING NON-EXISTANT MEMORY ERROR
032072  005067  147234                CLR     PCPUER          ;CLEAR TRAP THRU ERRVEC FLAG
032076  016767  150720  140244        MOV     $LSTBK,KIPAR4   ;GET READY TO GENERATE NON-EXISTANT ADDR.
032104  062767  000100  140236        ADD     #100,KIPAR4     ;MAKE SURE WE'RE IN NON-EXISTANT MEMORY.
032112  013701  100100          17$:  MOV     @#100100,R1     ;READ FROM NON-EXISTANT ADDRESS
032116  005767  147210                TST     PCPUER          ;SEE IF TRAP THRU ERRVEC OCCURRED
032122  001003                        BNE     8$              ;BRANCH TO EXIT IF TRAP OCCURED
032124  012700  100100                MOV     #100100,R0      ;SAVE VIRTUAL ADDRESS FOR ERROR TYPEOUT
032130  104046                        ERROR   +46             ;NO TRAP THRU ERRVEC
032132  005067  147176          8$:   CLR     CPUEXP          ;NO CPU TRAPS EXPECTED
032136  012767  031504  146744        MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
032144  000462                        BR      TST50           ;;BRANCH TO NEXT TEST

                                ;************* TRAP TO HERE THRU ERRVEC ******************

032146  012667  147154          10$:  MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS
032152  012667  147152                MOV     (KSP)+,OLDPS    ;SAVE RETURN PSW
```

```
2471 032156  016767  145604  147146          MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER FOR TYPING
2472 032164  022767  000040  147140          CMP     #40,PCPUER      ;WAS TRAP NON-EXISTANT MEMORY
2473 032172  001012                          BNE     12$             ;BRANCH IF MEMORY EXISTS
2474 032174  026767  140150  150620          CMP     KIPAR4,$LSTBK   ;SEE IF PAR4 MATCHES LAST BLOCK IN MEMORY
2475 032202  002404                          BLT     11$             ;BRANCH IF NO MATCH-ERROR IN COMPARE CIRCUITS
2476 032204  012767  031724  147114          MOV     #4$,OLDPC       ;CHANGE RETURN ADDRESS IF AT TOP OF MEMORY
2477 032212  000430                          BR      14$             ;BRANCH TO EXIT
2478 032214  104047                  11$:    ERROR   +47             ;PREMATURE END OF MEMORY FOUND
2479 032216  000426                          BR      14$             ;BRANCH TO EXIT
2480 032220  022767  000020  147104  12$:    CMP     #20,PCPUER      ;SEE IF ADDRESS TIMED OUT
2481 032226  001011                          BNE     13$             ;BRANCH IF NO TIME OUT,UNEXPECTED ERROR
2482 032230  005767  147102                  TST     HOLFLG          ;HAS THIS HAPPENED BEFORE?
2483 032234  001003                          BNE     15$             ;BRANCH IF NOT FIRST TIMEOUT
2484 032236  016767  140110  146734          MOV     KIPAR5,$TMP1    ;SAVE PAR WHERE HOLE FIRST DISCOVERED
2485 032244  005267  147066          15$:    INC     HOLFLG          ;KEEP COUNT OF SUCCESSIVE TIMEOUTS
2486 032250  000411                          BR      14$             ;BRANCH TO EXIT
2487 032252  016767  147050  147044  13$:    MOV     OLDPC,BADPC     ;MOVE PC OF UNEXPECTED ERROR FOR TYPEOUT
2488 032260  104001                          ERROR   +1              ;UNEXPECTED TRAP THROUGH ERRVEC
2489 032262  016767  146620  147036          MOV     $LPADR,OLDPC    ;RETURN TO BEGINNING OF TEST
2490 032270  005067  147042                  CLR     HOLFLG          ;CLEAR FLAG IN CASE IT WAS SET
2491 032274  005067  145466          14$:    CLR     CPUERR          ;CLEAR CPU ERROR REGISTER
2492 032300  016746  147024                  MOV     OLDPS,-(KSP)    ;PUSH OLD PSW ONTO STACK
2493 032304  016746  147016                  MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS ONTO STACK
2494 032310  000002                          RTI                     ;RETURN TO TEST AND CONTINUE
2508
2509
                        ;;*****************************************************************
                        ;*TEST 50       22-BIT MAPPING CARRY PROPAGATION
                        ;*
                        ;*      THIS TEST USES FULL 22-BIT RELOCATION TO CHECK THE CARRY
                        ;*      PROPAGATION THAT PERTAINS TO 22 BIT ADDRESSES. THIS TEST
                        ;*      SCANS MEMORY FROM 00740000 TO 16740000 OR THE LAST BLOCK,
                        ;*      ON 8K BOUNDARIES. IF ANY HOLES ARE FOUND, THE ADDRESS
                        ;*      WHERE THE HOLE WAS DISCOVERED AND THE FIRST GOOD ADDRESS
                        ;*      AFTER THE HOLE WILL BE REPORTED.
                        ;*
                        ;*      NOTE - PART OF THIS TEST WILL NOT BE RUN IF THERE IS LESS
                        ;*             THAN 120K ON THE SYSTEM.
                        ;*
                        ;;*****************************************************************
     032312  000004     TST50:  SCOPE
2510 032314  012700  100100                  MOV     #100100,R0      ;LOAD VIRTUAL ADDR FOR PAR4 INTO R0
2511 032320  012701  120000                  MOV     #120000,R1      ;LOAD VIRTUAL ADDR FOR PAR5 INTO R1
2512 032324  012767  000020  140164          MOV     #BIT4,MMR3      ;ENABLE 22 BIT MAPPING
2513 032332  005767  147002                  TST     HDWFLAG         ;IS THERE SPECIAL HARDWARE?
2514 032336  001004                          BNE     20$             ;BRANCH IF THERE IS
2515 032340  022767  007377  150454          CMP     #7377,$LSTBK    ;IS THERE AT LEAST 120K ON THE SYSTEM?
2516 032346  003112                          BGT     4$              ;BRANCH IF LESS THAN 120K
2517 032350  012767  033030  145426  20$:    MOV     #10$,ERRVEC     ;SET ERROR VECTOR POINTER TO 10$
2518 032356  005067  146754                  CLR     HOLFLG          ;MAKE SURE HOLE FLAG STARTS AT ZERO
2519 032362  012767  007377  137760          MOV     #7377,KIPAR4    ;LOAD PAR4 WITH STARTING BASE
2520 032370  012767  007400  137754          MOV     #7400,KIPAR5    ;LOAD BASE ADDRESS +100 INTO KIPAR5
2521 032376  012702  000360                  MOV     #360,R2         ;LOAD DATA PATTERN INTO R2
2522 032402  012767  032410  146500  1$:     MOV     #21$,$LPERR     ;SET LOOP ON ERROR POINTER TO 21$
2523 032410  005767  146724          21$:    TST     HDWFLAG         ;IS THERE SPECIAL HARDWARE?
2524 032414  001404                          BEQ     22$             ;BRANCH IF NOT
2525 032416  026767  137730  150376          CMP     KIPAR5,$LSTBK   ;ARE WE OUT OF MEMORY SPACE?
2526 032424  003025                          BGT     23$             ;BRANCH IF WE ARE
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2527 032426  005067  146700          22$:   CLR     PCPUER          ;CLEAR CPU ERROR FLAG
2528 032432  011167  146540                 MOV     (R1),$TMP0      ;SAVE DATA AT TEST LOCATION
2529 032436  005767  146670                 TST     PCPUER          ;SEE IF THERE WAS A CPU TRAP
2530 032442  001014                         BNE     2$              ;BRANCH IF TRAP OCCURRED
2531 032444  005767  146666                 TST     HOLFLG          ;SEE IF HOLE WAS FOUND IN MEMORY
2532 032450  001411                         BEQ     2$              ;BRANCH IF NO HOLE WAS FOUND
2533 032452  016767  137674  146522         MOV     KIPAR5,$TMP2    ;SAVE PAR THAT POINTS TO END OF HOLE
2534 032460  012767  032350  146422         MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO 20$
2535 032466  104050                         ERROR   +50             ;HOLE IN MEMORY FROM $TMP1 TO $TMP2
2536 032470  005067  146642                 CLR     HOLFLG          ;CLEAR HOLE FLAG IN CASE THERE ARE MORE
2537 032474  010210                  2$:    MOV     R2,(R0)         ;LOAD TEST PATTERN INTO TEST LOCATION
2538 032476  000405                         BR      24$             ;BRANCH OVER NEXT FEW INSTRUCTIONS
2539 032500  010204                  23$:   MOV     R2,R4           ;GET CURRENT DATA VALUE
2540 032502  052704  000400                 BIS     #BIT8,R4        ;SET SPECIAL HARDWARE ENABLE BIT
2541 032506  010467  145256                 MOV     R4,RMIREG       ;SETUP SPECIAL HARDWARE
2542 032512  011103                  24$:   MOV     (R1),R3         ;READ TEST LOCATION VIA DIFFERENT VIRT. ADDR.
2543 032514  020203                         CMP     R2,R3           ;SEE IF THE CORRECT LOCATION WAS REFERENCED
2544 032516  001401                         BEQ     3$              ;BRANCH IF CORRECT DATA WAS OBTAINED
2545 032520  104051                         ERROR   +51             ;BAD RELOCATION 22-BIT MAPPING
2546 032522  016711  146450          3$:    MOV     $TMP0,(R1)      ;RESTORE ORIGINAL DATA TO TEST LOCATION
2547 032526  062767  000400  137614         ADD     #400,KIPAR4     ;CHANGE BASE ADDRESS
2548 032534  062767  000400  137610         ADD     #400,KIPAR5     ;CHANGE BASE ADDRESS
2549 032542  005302                         DEC     R2              ;CHANGE DATA PATTERN
2550 032544  026767  137600  150250         CMP     KIPAR4,$LSTBK   ;IS THE PAR ABOVE THE LAST BLOCK OF MEMORY
2551 032552  003010                         BGT     4$              ;BRANCH IF ABOVE LAST MEM. LOC.
2552 032554  022767  167400  137570         CMP     #167400,KIPAR5  ;MAKE SURE YOU DON'T GO ON THE UNIBUS
2553 032562  103307                         BHIS    1$              ;BRANCH IF NOT PAST LAST ADDRESS
2554 032564  005767  146546                 TST     HOLFLG          ;SEE IF MEMORY ENDS WITH A HOLE
2555 032570  001401                         BEQ     4$              ;BRANCH IF NO HOLE AT END OF MEMORY
2556 032572  104052                         ERROR   +52             ;HOLE AT END OF MEMORY
2557                                 ;*
2558                                 ;*     UNIBUS ADDRESS 000000 IS GENERATED BY CARRY PROPAGATION
2559                                 ;*     SINCE THE MAP IS DISABLED, THIS SHOULD REFERENCE PHYSICAL
2560                                 ;*     ADDRESS 000000.
2561                                 ;*
2562 032574  012767  000020  137714  4$:    MOV     #BIT4,MMR3      ;ENABLE 22-BIT MAPPING
2563 032602  012767  003024  145174         MOV     #TIMERR,ERRVEC  ;RESTORE NORMAL ROUTINE FOR TRAPS THRU 4
2564 032610  012767  167777  137532         MOV     #167777,KIPAR4  ;GET READY TO TEST U.B. ADDRESS 0
2565 032616  012767  000000  137526         MOV     #000000,KIPAR5  ;SHOULD GO TO PHYSICAL ADDRESS 0
2566 032624  012702  017000                 MOV     #17000,R2       ;LOAD DATA PATTERN INTO R2
2567 032630  012767  032650  146252         MOV     #5$,$LPERR      ;SET LOOP ON ERROR POINTER TO 5$
2568 032636  012767  000020  146470         MOV     #20,CPUEXP      ;EXPECTING UNIBUS TIMEOUT
2569 032644  011067  146326                 MOV     (R0),$TMP0      ;SAVE DATA IN LOCATION 0 USING PAGE 4
2570 032650  010210                  5$:    MOV     R2,(R0)         ;LOAD DATA PATTERN INTO TEST LOCATION
2571 032652  011103                         MOV     (R1),R3         ;READ TEST LOCATION VIA DIFFERENT VIRT ADDR
2572 032654  016710  146316                 MOV     $TMP0,(R0)      ;RESTORE ORIGINAL DATA USING PAGE 4
2573 032660  020203                         CMP     R2,R3           ;SEE IF DATA MATCHES
2574 032662  001401                         BEQ     6$              ;BRANCH IF TRAP
2575 032664  104053                         ERROR   +53             ;BAD RELOCATION,UNIBUS ADDRESS
2576                                 ;*
2577                                 ;*     ADDRESS 000000 IS GENERATED BY CARRY PROPAGATION.  THEN, IF
2578                                 ;*     THERE IS LESS THAN 120K OF MEMORY ON THE SYSTEM, THE LAST
2579                                 ;*     BLOCK ($LSTBK) IS USED AS A PAR AND A CARRY IS PROPAGATED TO
2580                                 ;*     CAUSE A 22-BIT OVERFLOW.
2581                                 ;*
2582 032666  012767  032712  146214  6$:    MOV     #16$,$LPERR     ;SET LOOP ON ERROR POINTER TO 16$
2583 032674  005067  146434                 CLR     CPUEXP          ;NO TRAPS THRU ERRVEC EXPECTED HERE
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2584 032700 012767 177777 137442        MOV     #177777,KIPAR4  ;LOAD PAR4 WITH HIGHEST VALUE POSSIBLE
2585 032706 005037 000000               CLR     @#000000        ;CLEAR ADDRESS ZERO
2586 032712 013701 100100       16$:    MOV     @#100100,R1     ;THIS SHOULD READ ADDRESS ZERO INTO R1
2587 032716 005701                      TST     R1              ;SEE IF YOU READ ADDRESS ZERO
2588 032720 001401                      BEQ     7$              ;BRANCH IF ADDRESS ZERO WAS READ
2589 032722 104045                      ERROR   +45             ;DIDN'T READ ADDRESS ZERO
2590 032724 012767 032770 146156 7$:    MOV     #17$,$LPERR     ;SET LOOP ON ERROR POINTER TO 17$
2591 032732 022767 167777 150062        CMP     #167777,$LSTBK  ;IS MEMORY BLOCK SIZE < 167777
2592 032740 101423                      BLOS    8$              ;BRANCH IF MORE THAT 120K ON SYSTEM
2593 032742 012767 000040 146364        MOV     #40,CPUEXP      ;EXPECTING NON-EXISTANT MEMORY ERROR
2594 032750 005067 146356               CLR     PCPUER          ;CLEAR TRAP THRU ERRVEC FLAG
2595 032754 016767 150042 137366        MOV     $LSTBK,KIPAR4   ;GET READY TO GENERATE NON-EXISTANT ADDR.
2596 032762 062767 000100 137360        ADD     #100,KIPAR4     ;MAKE SURE WE ARE IN NON-EXISTANT MEMORY
2597 032770 013701 100100       17$:    MOV     @#100100,R1     ;READ FROM NON-EXISTANT ADDRESS
2598 032774 005767 146332               TST     PCPUER          ;SEE IF TRAP THRU ERRVEC OCCURRED
2599 033000 001003                      BNE     8$              ;BRANCH TO EXIT IF TRAP OCCURED
2600 033002 012700 100100               MOV     #100100,R0      ;SAVE VIRTUAL ADDRESS FOR ERROR TYPEOUT
2601 033006 104046                      ERROR   +46             ;NO TRAP THRU ERRVEC
2602 033010 005067 146320       8$:     CLR     CPUEXP          ;NO CPU TRAPS EXPECTED
2603 033014 012767 032350 146066        MOV     #20$,$LPERR     ;SET LOOP ON ERROR POINTER TO START OF TEST
2604 033022 005067 137470               CLR     MMR3            ;RETURN TO 18-BIT MAPPING
2605 033026 000462                      BR      TST51           ;;BRANCH TO NEXT TEST
2606
2607                            ;************* TRAP TO HERE THRU ERRVEC ******************
2608
2609 033030 012667 146272       10$:    MOV     (KSP)+,OLDPC    ;SAVE RETURN ADDRESS
2610 033034 012667 146270               MOV     (KSP)+,OLDPS    ;SAVE RETURN PSW
2611 033040 016767 144722 146264        MOV     CPUERR,PCPUER   ;SAVE CPU ERROR REGISTER FOR TYPING
2612 033046 022767 000040 146256        CMP     #40,PCPUER      ;WAS TRAP NON-EXISTANT MEMORY
2613 033054 001012                      BNE     12$             ;BRANCH IF MEMORY EXISTS
2614 033056 026767 137266 147736        CMP     KIPAR4,$LSTBK   ;SEE IF PAR4 MATCHES LAST BLOCK IN MEMORY
2615 033064 002404                      BLT     11$             ;BRANCH IF NO MATCH-ERROR IN COMPARE CIRCUITS
2616 033066 012767 032574 146232        MOV     #4$,OLDPC       ;CHANGE RETURN ADDRESS IF AT TOP OF MEMORY
2617 033074 000430                      BR      14$             ;BRANCH TO EXIT
2618 033076 104047              11$:    ERROR   +47             ;PREMATURE END OF MEMORY FOUND
2619 033100 000426                      BR      14$             ;BRANCH TO EXIT
2620 033102 022767 000020 146222 12$:   CMP     #20,PCPUER      ;SEE IF ADDRESS TIMED OUT
2621 033110 001011                      BNE     13$             ;BRANCH IF NO TIME OUT,UNEXPECTED ERROR
2622 033112 005767 146220               TST     HOLFLG          ;HAS THIS HAPPENED BEFORE?
2623 033116 001003                      BNE     15$             ;BRANCH IF NOT FIRST TIMEOUT
2624 033120 016767 137226 146052        MOV     KIPAR5,$TMP1    ;SAVE PAR WHERE HOLE FIRST DISCOVERED
2625 033126 005267 146204       15$:    INC     HOLFLG          ;KEEP COUNT OF SUCCESSIVE TIMEOUTS
2626 033132 000411                      BR      14$             ;BRANCH TO EXIT
2627 033134 016767 146166 146162 13$:   MOV     OLDPC,BADPC     ;MOVE PC OF UNEXPECTED ERROR FOR TYPEOUT
2628 033142 104001                      ERROR   +1              ;UNEXPECTED TRAP THROUGH ERRVEC
2629 033144 016767 145736 146154        MOV     $LPADR,OLDPC    ;RETURN TO BEGINNING OF TEST
2630 033152 005067 146160               CLR     HOLFLG          ;CLEAR FLAG IN CASE IT WAS SET
2631 033156 005067 144604       14$:    CLR     CPUERR          ;CLEAR CPU ERROR REGISTER
2632 033162 016746 146142               MOV     OLDPS,-(KSP)    ;PUSH OLD PSW ONTO STACK
2633 033166 016746 146134               MOV     OLDPC,-(KSP)    ;PUSH RETURN ADDRESS ONTO STACK
2634 033172 000002                      RTI                     ;RETURN TO TEST AND CONTINUE
2635
2656                            ;;*****************************************************************
                                ;*TEST 51        READ AND WRITE WHILE IN RELOCATE MODE
                                ;*
                                ;*       THE FOLLOWING TEST TURNS ON MEMORY MANAGEMENT AND THEN
                                ;*       READS AND WRITES LOCATIONS BETWEEN PHYSICAL ADDRESSES
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                                ;*      060000-067600.  ONE LOCATION IN EVERY BLOCK (32. WORDS)
                                ;*      IS WRITTEN USING PAR4 AND READ USING PAR5.  THIS IS
                                ;*      DONE IN BOTH USER AND KERNEL MODES. THE 'MODE'' INPUT TO
                                ;*      THE PAR/PDR ADDRESS MUX IS CHECKED BY READING AND WRITING
                                ;*      IN USER MODE.  REMEMBER ALSO, THAT SINCE MEMORY MANAGEMENT
                                ;*      IS ON (IN RELOCATE MODE) THE PROGRAM ITSELF IS USING ITS
                                ;*      VIRTUAL ADDRESSES AND THE PAR/PDR'S TO EXECUTE.
                                ;*
                                ;*      WHILE TESTING IN KERNEL MODE, USER PAGES 4 & 5 ARE MAPPED
                                ;*      NON-RESIDENT WITH DIFFERENT PAR VALUES THAN THE KERNEL
                                ;*      PAR'S TO BE SURE THAT THE KERNEL PAR'S AND PDR'S ARE BEING
                                ;*      USED WHEN IN KERNEL MODE (AND VICE VERSA WHILE TESTING IN
                                ;*      USER MODE).  IF A MEM. MGMT. TRAP OCCURS, THE PROGRAM GOES
                                ;*      TO 8$ WHERE THE TRAP IS REPORTED.
                                ;*
                                ;;*********************************************************************
     033174  000004             TST51:  SCOPE
2657
2658 033176  005067  144574     1$:     CLR     PSW             ;START IN KERNEL MODE
2659 033202  012704  000577             MOV     #577,R4         ;LOAD R4 WITH VALUE FOR PAR4
2660 033206  012705  000600             MOV     #600,R5         ;LOAD R5 WITH VALUE FOR PAR5
2661 033212  010467  137132             MOV     R4,KIPAR4       ;LOAD KERNEL PAR4
2662 033216  010567  137130             MOV     R5,KIPAR5       ;LOAD KERNEL PAR5
2663 033222  012700  177640             MOV     #UIPAR0,R0      ;LOAD ADDRESS OF FIRST USER PAR IN R0
2664 033226  012703  172240             MOV     #SIPAR0,R3      ;LOAD ADDRESS OF FIRST SUPERVISOR PAR IN R3
2665 033232  005001                     CLR     R1              ;CLEAR R1
2666 033234  012702  000007             MOV     #7,R2           ;LOAD LOOP COUNTER WITH A 7
2667 033240  010120             2$:     MOV     R1,(R0)+        ;MAP USER PAR'S TO PAGES 0-6 (4K EACH)
2668 033242  010123                     MOV     R1,(R3)+        ;MAP SUPERVISOR PAR'S TO PAGES 0-6 (4K EACH)
2669 033244  062701  000200             ADD     #200,R1
2670 033250  077205                     SOB     R2,2$           ;LOOP UNTIL UIPAR0-UIPAR6 ARE LOADED
2671 033252  012710  007600             MOV     #7600,(R0)      ;MAP USER PAR7 TO THE I/O PAGE
2672 033256  012713  007600             MOV     #7600,(R3)      ;MAP SUPERVISOR PAR7 TO THE I/O PAGE
2673 033262  012700  177600             MOV     #UIPDR0,R0      ;LOAD ADDRESS OF FIRST USER PDR IN R0
2674 033266  012703  172200             MOV     #SIPDR0,R3      ;LOAD ADDRESS OF FIRST SUPERVISOR PDR IN R3
2675 033272  012701  077406             MOV     #77406,R1       ;LOAD PDR DATA INTO R1
2676 033276  012702  000010             MOV     #10,R2          ;LOAD LOOP COUNTER WITH AN 8
2677 033302  010120             3$:     MOV     R1,(R0)+        ;MAP ALL 8 PAGES 128 BLOCKS, UPWARD
2678 033304  010123                     MOV     R1,(R3)+        ;       EXPANDABLE,READ/WRITE FOR
2679 033306  077203                     SOB     R2,3$           ;       USER AND SUPERVISOR MODES.
2680 033310  105067  144274             CLRB    UIPDR4          ;MAP USER SPACE NON-RESIDENT WHILE
2681 033314  105067  144272             CLRB    UIPDR5          ;       TESTING KERNEL SPACE
2682 033320  105067  136664             CLRB    SIPDR4          ;MAP SUPERVISOR SPACE NON-RESIDENT WHILE
2683 033324  105067  136662             CLRB    SIPDR5          ;       TESTING KERNEL SPACE
2684 033330  010567  144314             MOV     R5,UIPAR4       ;MAP USER PAR'S OPPOSITE OF KIPAR'S
2685 033334  010467  144312             MOV     R4,UIPAR5
2686 033340  010567  136704             MOV     R5,SIPAR4       ;MAP SUPERVISOR PAR'S OPPOSITE OF KIPAR'S
2687 033344  010467  136702             MOV     R4,SIPAR5
2688 033350  012767  000001  144214     MOV     #1,SR0          ;TURN ON MEMORY MANAGEMENT (RELOCATE MODE)
2689 033356  012767  033410  145524     MOV     #5$,$LPERR      ;SET LOOP ON ERROR POINTER TO 5$
2690 033364  012767  033732  144656     MOV     #8$,MMVEC       ;SET M. M. TRAP VECTOR TO 8$
2691 033372  016767  144400  145576 4$:  MOV     PSW,$TMP0       ;SAVE PSW IN CASE OF ERROR
2692 033400  012700  100100             MOV     #100100,R0      ;PUT VIRTUAL ADDR. THAT USES PAR4 IN R0
2693 033404  012701  120000             MOV     #120000,R1      ;PUT VIRTUAL ADDR. THAT USES PAR5 IN R1
2694 033410  010010             5$:     MOV     R0,(R0)         ;WRITE TO TEST LOC. USING PAR4
2695 033412  011102                     MOV     (R1),R2         ;READ THE SAME LOC., BUT USING PAR5
2696 033414  020002                     CMP     R0,R2           ;DID WE READ WHAT WE WROTE?
```

```
2697 033416  001411                    BEQ     6$              ;BRANCH IF YES
2698 033420  010167  145654            MOV     R1,VIRT2        ;SAVE VIRTUAL ADDR. THAT SELECTED PAR5
2699 033424  010067  145646            MOV     R0,VIRT1        ;SAVE VIRTUAL ADDR. THAT SELECTED PAR4
2700 033430  004767  147564            JSR     PC,FORMPA       ;GO FORM PHYSICAL ADDRESS  BEING USED
2701 033434  104020                    ERROR   +20             ;READING LOC. USING PAR5 AND A VIRT.
2702                                                           ;ADDR. DID NOT FIND DATA WRITTEN WHEN USING
2703                                                           ;PAR4 AND VIRT. ADDRESS.
2704                                                           ;FOR TIGHTER SCOPE LOOP
2705                                                           ;REPLACE ERROR CALL WITH
2706                                                           ;'BR 5$'' = 000765
2707 033436  016700  145634            MOV     VIRT1,R0        ;RESTORE VBA IN R0
2708 033442  062700  000100      6$:   ADD     #100,R0         ;CHANGE VIRTUAL ADDRS. TO POINT TO NEXT BLOCK
2709 033446  062701  000100            ADD     #100,R1
2710 033452  020127  127700            CMP     R1,#127700      ;WERE BLOCKS FROM 60000-67600 ALL TRIED?
2711 033456  001354                    BNE     5$              ;BRANCH IF NO
2712 033460  032767  140000  144310    BIT     #140000,PSW     ;HAVE WE DONE TEST IN USER MODE YET?
2713 033466  001026                    BNE     7$              ;BRANCH IF YES
2714 033470  010467  144154            MOV     R4,UIPAR4       ;LOAD USER PAR4
2715 033474  010567  144152            MOV     R5,UIPAR5       ;LOAD USER PAR5
2716 033500  112767  000006  144102    MOVB    #6,UIPDR4       ;MAP USER SPACE R/W TO TEST IT
2717 033506  112767  000006  144076    MOVB    #6,UIPDR5
2718 033514  105067  136570            CLRB    KIPDR4          ;MAP  KERNEL SPACE NON-RESIDENT WHILE
2719 033520  105067  136566            CLRB    KIPDR5          ;       TESTING USER SPACE
2720 033524  010567  136620            MOV     R5,KIPAR4       ;MAP KERNEL PAR'S OPPOSITE UIPAR'S
2721 033530  010467  136616            MOV     R4,KIPAR5
2722 033534  012767  140000  144234    MOV     #140000,PSW     ;GO TO USER MODE
2723 033542  000713                    BR      4$              ;GO BACK AND READ/WRITE IN USER MODE
2724 033544  032767  040000  144224  7$:   BIT     #40000,PSW      ;HAVE WE DONE TEST IN SUPERVISOR MODE YET?
2725 033552  001026                    BNE     10$             ;BRANCH IF YES
2726 033554  010467  136470            MOV     R4,SIPAR4       ;LOAD SUPERVISOR PAR4
2727 033560  010567  136466            MOV     R5,SIPAR5       ;LOAD SUPERVISOR PAR5
2728 033564  112767  000006  136416    MOVB    #6,SIPDR4       ;MAP SUPERVISOR SPACE R/W TO TEST IT
2729 033572  112767  000006  136412    MOVB    #6,SIPDR5
2730 033600  105067  144004            CLRB    UIPDR4          ;MAP USER SPACE NON-RESIDENT WHILE
2731 033604  105067  144002            CLRB    UIPDR5          ;       TESTING USER SPACE
2732 033610  010567  144034            MOV     R5,UIPAR4       ;MAP USER PAR'S OPPOSITE SIPAR'S
2733 033614  010467  144032            MOV     R4,UIPAR5
2734 033620  012767  040000  144150    MOV     #40000,PSW      ;GO TO SUPERVISOR MODE
2735 033626  000661                    BR      4$              ;GO BACK AND READ/WRITE IN SUPERVISOR MODE
2736 033630  005067  144142      10$:  CLR     PSW             ;GO BACK TO KERNEL MODE BEFORE LEAVING
2737 033634  012767  077406  136446    MOV     #77406,KIPDR4   ;REMAP KERNEL PAGES READ/WRITE
2738 033642  012767  077406  136442    MOV     #77406,KIPDR5
2739 033650  012767  077406  143732    MOV     #77406,UIPDR4   ;REMAP USER PAGES READ/WRITE
2740 033656  012767  077406  143726    MOV     #77406,UIPDR5
2741 033664  010567  136460            MOV     R5,KIPAR4       ;MAP KERNEL, SUPERVISOR AND USER PAR'S 4 & 5
2742 033670  010567  136456            MOV     R5,KIPAR5       ;  BACK TO 12-16K
2743 033674  010567  143750            MOV     R5,UIPAR4
2744 033700  010567  143746            MOV     R5,UIPAR5
2745 033704  010567  136340            MOV     R5,SIPAR4
2746 033710  010567  136336            MOV     R5,SIPAR5
2747 033714  012767  003122  144326    MOV     #MGMERR,MMVEC   ;RESTORE ADDR. OF NORMAL M.M. TRAP ROUTINE
2748 033722  012767  033176  145160    MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
2749 033730  000427                    BR      TST52           ;;BRANCH TO NEXT TEST
2750
2751                                ;**********      TRAP TO HERE THRU ERRVEC       **********
```

```
2753
2754 033732  012667  145322          8$:     MOV     (KSP)+,TRAPPC   ;SAVE PC & PS OF TRAP
2755 033736  012667  145320                  MOV     (KSP)+,TRAPPS
2756                                                                  ;PROGRAM WILL TRAP TO HERE IF TRY
2757                                                                  ;TO USE USER/SUPERVISOR PDR'S WHEN IN KERNEL MODE
2758                                                                  ;OR KERNEL PDR'S WHEN IN USER/SUPERVISOR MODE
2759 033742  010067  145330                  MOV     R0,VIRT1        ;SAVE VIRTUAL ADDRESS FOR ERROR REPORT
2760 033746  004767  147246                  JSR     PC,FORMPA       ;GO FORM THE PHYSICAL ADDRESS  BEING USED
2761 033752  016767  143614  145304          MOV     SR0,WASSR0      ;SAVE SR0 & SR2  FOR ERROR REPORT
2762 033760  016767  143612  145302          MOV     SR2,WASSR2
2763 033766  042767  160000  143576          BIC     #160000,SR0     ;CLEAR ERROR BITS IN SR0
2764 033774  104022                          ERROR   +22             ;M.M. TRAP WHILE IN RELOCATE MODE -
2765                                                                  ;REFERENCED WRONG SET OF PDR'S
2766                                                                  ;FOR TIGHTER SCOPE LOOP
2767                                                                  ;REPLACE ERROR CALL WITH
2768                                                                  ;A 'NOP' = 000240
2769 033776  016746  145260                  MOV     TRAPPS,-(KSP)   ;PUT PC & PS OF TRAP ON STACK
2770 034002  016746  145252                  MOV     TRAPPC,-(KSP)
2771 034006  000002                          RTI                     ;RETURN TO TEST
```

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                                ;/.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\
                                .SBTTL  GROUP 4                 W-BIT TESTS
                                ;/.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\./.\


                                ;;*********************************************************************
                                ;*TEST 52       W-BIT LOGIC TEST, KERNEL PDR'S
                                ;*       THIS TEST WRITES TO EIGHT (8) DIFFERENT VIRTUAL ADDRESSES
                                ;*       (VBA'S = 17776,37776,57776,77776,117776,137776,157776 & 177776
                                ;*       & PBA'S CONSTRUCTED = 17776, 37776, 57776, 77776, 77776,
                                ;*       77776, 77776, & 77776 RESPECTIVELY).
                                ;*       WHICH SHOULD CAUSE THE 'W-BIT" TO SET IN EACH OF THE
                                ;*       EIGHT (8) KERNEL PAGE DESCRIPTOR REGISTERS.  THE PDR'S
                                ;*       ARE CHECKED TO SEE THAT IT'S W-BIT DOES SET WHEN THE
                                ;*       PAGE IT IS MAPPED TO IS WRITTEN TO AND THAT THE W-BIT
                                ;*       DOES NOT SET IN ANY OF THE OTHER PDR'S.  KERNEL PDR'S 3,4,5 & 6
                                ;*       ARE MAPPED TO 12-16K FOR THIS TEST.  ALSO THE W-BIT
                                ;*       SHOULD BE CLEARED WHEN THE PDR IS WRITTEN TO.  THE
                                ;*       W-BIT PORTION OF THE PDR'S AND THE PAR/PDR ADRS MUX
                                ;*       ARE BEING CHECKED.
                                ;;*********************************************************************
    034010  000004              TST52:  SCOPE
2782 034012
                                1$:
    034012  004767  146154              JSR     PC,TOFF         ;TURN T-BIT TRAPPING OFF FOR THIS TEST
    034016  012702  000004              MOV     #4,R2           ;SET LOOP COUNTER TO 4
    034022  012700  172346              MOV     #KIPAR3,R0      ;LOAD ADDRESS OF KIPAR3 INTO R0
    034026  012701  000600              MOV     #600,R1         ;LOAD "12-16K" PAR VALUE INTO R1
    034032  010120              2$:     MOV     R1,(R0)+        ;MAP PARS 3-6 TO 12-16K
    034034  077202                      SOB     R2,2$           ;LOOP UNTIL ALL 4 OF THEM ARE LOADED
    034036  012705  172300              MOV     #KIPDR0,R5      ;LOAD ADDRESS OF FIRST PDR TO BE TESTED IN R5
    034042  012704  000010              MOV     #8.,R4          ;SET LOOP COUNTER TO 8
    034046  012703  017776              MOV     #17776,R3       ;INITIALIZE VIRTUAL ADDRESS TO BE IN R3
    034052  012767  034060  145030      MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
    034060  012700  172300      3$:     MOV     #KIPDR0,R0      ;LOAD ADDR. OF FIRST PDR TO BE SETUP IN R0
    034064  012702  000010              MOV     #8.,R2          ;SET LOOP CONTER TO 8
    034070  012701  077406              MOV     #77406,R1       ;PUT "W-BIT OFF DATA" INTO R1
    034074  010120              4$:     MOV     R1,(R0)+        ;CLEAR ALL W-BITS BY WRITING TO ALL PDRS
    034076  077202                      SOB     R2,4$           ;LOOP UNTIL ALL OF THEM ARE SET UP
    034100  011313                      MOV     (R3),(R3)       ;DO "DATO" TO VIRTUAL ADDR.-SETTING A W-BIT
    034102  031527  000100              BIT     (R5),#WBIT      ;DID THAT CAUSE W-BIT TO BE SET?
    034106  001002                      BNE     5$              ;BRANCH IF YES
    034110  104054                      ERROR   +54             ;W-BIT DID NOT GET SET IN PDR
                                                                ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                ;CALL WITH "BR 3$" = 000763
    034112  000422                      BR      8$              ;SKIP CHECKING OTHER PDR'S-ERROR WILL SET W-BITS
    034114  012702  000010      5$:     MOV     #8.,R2          ;SET LOOP COUNTER TO 8
    034120  012700  172300              MOV     #KIPDR0,R0      ;LOAD ADDR. OF FIRST PDR TO BE CHECKED IN R0
    034124  031027  000100      6$:     BIT     (R0),#WBIT      ;DID W-BIT IN OTHER PDRS REMAIN CLEAR?
    034130  001403                      BEQ     7$              ;BRANCH IF YES
    034132  020500                      CMP     R5,R0           ;IF W-BIT SET, THEN WAS IT PDR UNDER TEST?
    034134  001401                      BEQ     7$              ;BRANCH IF YES
    034136  104055                      ERROR   +55             ;W-BIT GOT SET IN MORE THAN ONE PDR
                                                                ;FOR TGHTE SCOPE LOOP, REPLACE ERROR
                                                                ;CALL WITH "BR 3$" = 000750
    034140  062700  000002      7$:     ADD     #2,R0           ;POINT R0 TO NEXT PDR TO BE CHECKED
    034144  077211                      SOB     R2,6$           ;LOOP UNTIL ALL 8 CHECKED FOR CLEAR W-BIT
    034146  010115                      MOV     R1,(R5)         ;WRITE TO THE PDR TESTED TO CLEAR W-BIT
```

```
034150  031527  000100                  BIT     (R5),#WBIT      ;DID WRITING PDR CLEAR THE W-BIT?
034154  001401                          BEQ     8$              ;BRANCH IF YES
034156  104056                          ERROR   +56             ;W-BIT DID NOT CLEAR BY WRITNG THE PDR
                                                                ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR CALL
                                                                ;WITH 'BR 3$'' = 000740
034160  062705  000002          8$:     ADD     #2,R5           ;POINT R5 TO THE NEXT PDR TO BE TESTED
034164  062703  020000                  ADD     #20000,R3       ;CHANGE VIRT. ADDR TO REF. NEXT PDR
034170  077445                          SOB     R4,3$           ;LOOP BACK TO 3$ UNTIL ALL 8 PDR'S TESTED
034172  012767  034012  144710          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
034200  004767  146022                  JSR     PC,TON          ;TURN T-BIT BACK ON FOR NEXT TEST
 2783
 2787                           ;;*****************************************************************
                                ;*TEST 53       W-BIT LOGIC TEST, SUPERVISOR PDR'S
                                ;*      THIS TEST WRITES TO EIGHT (8) DIFFERENT VIRTUAL ADDRESSES
                                ;*      (VBA'S = 17776,37776,57776,77776,117776,137776,157776 & 177776
                                ;*      & PBA'S CONSTRUCTED = 17776, 37776, 57776, 77776, 77776,
                                ;*      77776, 77776, & 77776 RESPECTIVELY).
                                ;*      WHICH SHOULD CAUSE THE 'W-BIT'' TO SET IN EACH OF THE
                                ;*      EIGHT (8) SUPERVISOR PAGE DESCRIPTOR REGISTERS.  THE PDR'S
                                ;*      ARE CHECKED TO SEE THAT IT'S W-BIT DOES SET WHEN THE
                                ;*      PAGE IT IS MAPPED TO IS WRITTEN TO AND THAT THE W-BIT
                                ;*      DOES NOT SET IN ANY OF THE OTHER PDR'S.  SUPERVISOR PDR'S 3,4,5 & 6
                                ;*      ARE MAPPED TO 12-16K FOR THIS TEST.  ALSO THE W-BIT
                                ;*      SHOULD BE CLEARED WHEN THE PDR IS WRITTEN TO.  THE
                                ;*      W-BIT PORTION OF THE PDR'S AND THE PAR/PDR ADRS MUX
                                ;*      ARE BEING CHECKED.
                                ;;*****************************************************************
034204  000004                  TST53:  SCOPE
 2788 034206  012767  040000  143562  1$:     MOV     #40000,PSW      ;GO TO SUPERVISOR MODE FOR THIS TEST
 2789 034214  004767  145752          JSR     PC,TOFF         ;TURN T-BIT TRAPPING OFF FOR THIS TEST
034220  012702  000004                  MOV     #4,R2           ;SET LOOP COUNTER TO 4
034224  012700  172246                  MOV     #SIPAR3,R0      ;LOAD ADDRESS OF SIPAR3 INTO R0
034230  012701  000600                  MOV     #600,R1         ;LOAD ''12-16K'' PAR VALUE INTO R1
034234  010120                  2$:     MOV     R1,(R0)+        ;MAP PARS 3-6 TO 12-16K
034236  077202                          SOB     R2,2$           ;LOOP UNTIL ALL 4 OF THEM ARE LOADED
034240  012705  172200                  MOV     #SIPDR0,R5      ;LOAD ADDRESS OF FIRST PDR TO BE TESTED IN R5
034244  012704  000010                  MOV     #8.,R4          ;SET LOOP COUNTER TO 8
034250  012703  017776                  MOV     #17776,R3       ;INITIALIZE VIRTUAL ADDRESS TO BE IN R3
034254  012767  034262  144626          MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
034262  012700  172200          3$:     MOV     #SIPDR0,R0      ;LOAD ADDR. OF FIRST PDR TO BE SETUP IN R0
034266  012702  000010                  MOV     #8.,R2          ;SET LOOP CONTER TO 8
034272  012701  077406                  MOV     #77406,R1       ;PUT ''W-BIT OFF DATA'' INTO R1
034276  010120                  4$:     MOV     R1,(R0)+        ;CLEAR ALL W-BITS BY WRITING TO ALL PDRS
034300  077202                          SOB     R2,4$           ;LOOP UNTIL ALL OF THEM ARE SET UP
034302  011313                          MOV     (R3),(R3)       ;DO ''DATO'' TO VIRTUAL ADDR.-SETTING A W-BIT
034304  031527  000100                  BIT     (R5),#WBIT      ;DID THAT CAUSE W-BIT TO BE SET?
034310  001002                          BNE     5$              ;BRANCH IF YES
034312  104054                          ERROR   +54             ;W-BIT DID NOT GET SET IN PDR
                                                                ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                ;CALL WITH 'BR 3$'' = 000763
034314  000422                          BR      8$              ;SKIP CHECKING OTHER PDR'S-ERROR WILL SET W-BITS
034316  012702  000010          5$:     MOV     #8.,R2          ;SET LOOP COUNTER TO 8
034322  012700  172200                  MOV     #SIPDR0,R0      ;LOAD ADDR. OF FIRST PDR TO BE CHECKED IN R0
034326  031027  000100          6$:     BIT     (R0),#WBIT      ;DID W-BIT IN OTHER PDRS REMAIN CLEAR?
034332  001403                          BEQ     7$              ;BRANCH IF YES
034334  020500                          CMP     R5,R0           ;IF W-BIT SET, THEN WAS IT PDR UNDER TEST?
034336  001401                          BEQ     7$              ;BRANCH IF YES
```

```
        034340  104055                          ERROR   +55             ;W-BIT GOT SET IN MORE THAN ONE PDR
                                                                        ;FOR TGHTE SCOPE LOOP, REPLACE ERROR
                                                                        ;CALL WITH 'BR 3$'' = 000750
        034342  062700  000002          7$:     ADD     #2,R0           ;POINT R0 TO NEXT PDR TO BE CHECKED
        034346  077211                          SOB     R2,6$           ;LOOP UNTIL ALL 8 CHECKED FOR CLEAR W-BIT
        034350  010115                          MOV     R1,(R5)         ;WRITE TO THE PDR TESTED TO CLEAR W-BIT
        034352  031527  000100                  BIT     (R5),#WBIT      ;DID WRITING PDR CLEAR THE W-BIT?
        034356  001401                          BEQ     8$              ;BRANCH IF YES
        034360  104056                          ERROR   +56             ;W-BIT DID NOT CLEAR BY WRITNG THE PDR
                                                                        ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR CALL
                                                                        ;WITH 'BR 3$'' = 000740
        034362  062705  000002          8$:     ADD     #2,R5           ;POINT R5 TO THE NEXT PDR TO BE TESTED
        034366  062703  020000                  ADD     #20000,R3       ;CHANGE VIRT. ADDR TO REF. NEXT PDR
        034372  077445                          SOB     R4,3$           ;LOOP BACK TO 3$ UNTIL ALL 8 PDR'S TESTED
        034374  012767  034206  144506          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
        034402  004767  145620                  JSR     PC,TON          ;TURN T-BIT BACK ON FOR NEXT TEST
2790    034406  005067  143364                  CLR     PSW             ;BACK TO KERNAL MODE BEFORE LEAVING
2791
2795                                    ;;*****************************************************************
                                        ;*TEST 54       W-BIT LOGIC TEST, USER PDR'S
                                        ;*      THIS TEST WRITES TO EIGHT (8) DIFFERENT VIRTUAL ADDRESSES
                                        ;*      (VBA'S = 17776,37776,57776,77776,117776,137776,157776 & 177776
                                        ;*      & PBA'S CONSTRUCTED = 17776, 37776, 57776, 77776, 77776,
                                        ;*      77776, 77776, & 77776 RESPECTIVELY).
                                        ;*      WHICH SHOULD CAUSE THE 'W-BIT'' TO SET IN EACH OF THE
                                        ;*      EIGHT (8) USER PAGE DESCRIPTOR REGISTERS.  THE PDR'S
                                        ;*      ARE CHECKED TO SEE THAT IT'S W-BIT DOES SET WHEN THE
                                        ;*      PAGE IT IS MAPPED TO IS WRITTEN TO AND THAT THE W-BIT
                                        ;*      DOES NOT SET IN ANY OF THE OTHER PDR'S.  USER PDR'S 3,4,5 & 6
                                        ;*      ARE MAPPED TO 12-16K FOR THIS TEST.  ALSO THE W-BIT
                                        ;*      SHOULD BE CLEARED WHEN THE PDR IS WRITTEN TO.  THE
                                        ;*      W-BIT PORTION OF THE PDR'S AND THE PAR/PDR ADRS MUX
                                        ;*      ARE BEING CHECKED.
                                        ;;*****************************************************************
        034412  000004                  TST54:  SCOPE
2796    034414  012767  140000  143354  1$:     MOV     #140000,PSW     ;GO TO USER MODE FOR THIS TEST
2797    034422  004767  145544                  JSR     PC,TOFF         ;TURN T-BIT TRAPPING OFF FOR THIS TEST
        034426  012702  000004                  MOV     #4,R2           ;SET LOOP COUNTER TO 4
        034432  012700  177646                  MOV     #UIPAR3,R0      ;LOAD ADDRESS OF UIPAR3 INTO R0
        034436  012701  000600                  MOV     #600,R1         ;LOAD '12-16K'' PAR VALUE INTO R1
        034442  010120                  2$:     MOV     R1,(R0)+        ;MAP PARS 3-6 TO 12-16K
        034444  077202                          SOB     R2,2$           ;LOOP UNTIL ALL 4 OF THEM ARE LOADED
        034446  012705  177600                  MOV     #UIPDR0,R5      ;LOAD ADDRESS OF FIRST PDR TO BE TESTED IN R5
        034452  012704  000010                  MOV     #8.,R4          ;SET LOOP COUNTER TO 8
        034456  012703  017776                  MOV     #17776,R3       ;INITIALIZE VIRTUAL ADDRESS TO BE IN R3
        034462  012767  034470  144420          MOV     #3$,$LPERR      ;SET LOOP ON ERROR POINTER TO 3$
        034470  012700  177600          3$:     MOV     #UIPDR0,R0      ;LOAD ADDR. OF FIRST PDR TO BE SETUP IN R0
        034474  012702  000010                  MOV     #8.,R2          ;SET LOOP CONTER TO 8
        034500  012701  077406                  MOV     #77406,R1       ;PUT 'W-BIT OFF DATA'' INTO R1
        034504  010120                  4$:     MOV     R1,(R0)+        ;CLEAR ALL W-BITS BY WRITING TO ALL PDRS
        034506  077202                          SOB     R2,4$           ;LOOP UNTIL ALL OF THEM ARE SET UP
        034510  011313                          MOV     (R3),(R3)       ;DO 'DATO'' TO VIRTUAL ADDR.-SETTING A W-BIT
        034512  031527  000100                  BIT     (R5),#WBIT      ;DID THAT CAUSE W-BIT TO BE SET?
        034516  001002                          BNE     5$              ;BRANCH IF YES
        034520  104054                          ERROR   +54             ;W-BIT DID NOT GET SET IN PDR
                                                                        ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR
                                                                        ;CALL WITH 'BR 3$'' = 000763
```

```
        034522  000422                          BR      8$              ;SKIP CHECKING OTHER PDR'S-ERROR WILL SET W-BITS
        034524  012702  000010          5$:     MOV     #8.,R2          ;SET LOOP COUNTER TO 8
        034530  012700  177600                  MOV     #UIPDR0,R0      ;LOAD ADDR. OF FIRST PDR TO BE CHECKED IN R0
        034534  031027  000100          6$:     BIT     (R0),#WBIT      ;DID W-BIT IN OTHER PDRS REMAIN CLEAR?
        034540  001403                          BEQ     7$              ;BRANCH IF YES
        034542  020500                          CMP     R5,R0           ;IF W-BIT SET, THEN WAS IT PDR UNDER TEST?
        034544  001401                          BEQ     7$              ;BRANCH IF YES
        034546  104055                          ERROR   +55             ;W-BIT GOT SET IN MORE THAN ONE PDR
                                                                        ;FOR TGHTE SCOPE LOOP, REPLACE ERROR
                                                                        ;CALL WITH 'BR 3$'' = 000750
        034550  062700  000002          7$:     ADD     #2,R0           ;POINT R0 TO NEXT PDR TO BE CHECKED
        034554  077211                          SOB     R2,6$           ;LOOP UNTIL ALL 8 CHECKED FOR CLEAR W-BIT
        034556  010115                          MOV     R1,(R5)         ;WRITE TO THE PDR TESTED TO CLEAR W-BIT
        034560  031527  000100                  BIT     (R5),#WBIT      ;DID WRITING PDR CLEAR THE W-BIT?
        034564  001401                          BEQ     8$              ;BRANCH IF YES
        034566  104056                          ERROR   +56             ;W-BIT DID NOT CLEAR BY WRITNG THE PDR
                                                                        ;FOR TIGHTER SCOPE LOOP, REPLACE ERROR CALL
                                                                        ;WITH 'BR 3$'' = 000740
        034570  062705  000002          8$:     ADD     #2,R5           ;POINT R5 TO THE NEXT PDR TO BE TESTED
        034574  062703  020000                  ADD     #20000,R3       ;CHANGE VIRT. ADDR TO REF. NEXT PDR
        034600  077445                          SOB     R4,3$           ;LOOP BACK TO 3$ UNTIL ALL 8 PDR'S TESTED
        034602  012767  034414  144300          MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
        034610  004767  145412                  JSR     PC,TON          ;TURN T-BIT BACK ON FOR NEXT TEST
   2798 034614  005067  143156                  CLR     PSW             ;BACK TO KERNEL MODE BEFORE LEAVING
```

```
                        ;;*****************************************************************
                        ;*TEST 55       TEST 'W-BIT NOT SET'' CASES
                        ;*
                        ;*      THIS TEST CHECKS TWO SPECIAL CASES WHERE THE W-BIT DOES
                        ;*      NOT GET SET ON A WRITE.  FIRST CASE IS THAT THE W-BIT
                        ;*      SHOULD NOT SET IN PAGE DESCRIPTOR REG. 7 WHEN WRITING TO
                        ;*      STATUS REG SR0 (KERNEL PDR 7 IS USED).  SECOND CASE IS THAT
                        ;*      THE W-BIT IS NOT SET IF THE 'DATO'' IS ABORTED DUE TO AN
                        ;*      ODD ADDRESS ERROR (KERNEL PDR3 & VIRTUAL ADDR 60001 ARE USED).
                        ;*
                        ;;*****************************************************************
 034620  000004         TST55:  SCOPE
2811
2812 034622  004767  145344      1$:     JSR     PC,TOFF         ;TURN OFF T-BIT TRAPPING FOR THIS TEST
2813 034626  012701  077406              MOV     #77406,R1       ;PUT 'W-BIT OFF'' VALUE FOR PDR IN R1
2814 034632  012767  034632  144250  2$: MOV     #2$,$LPERR      ;SET LOOP ON ERROR POINTER TO 2$
2815 034640  010167  135442              MOV     R1,KIPDR3       ;LOAD KERNEL PDR3 WITH 77406 TO CLEAR W-BIT
2816 034644  012767  034656  143132      MOV     #3$,ERRVEC      ;SET UP LOC. 4 TO 3$ FOR ODD ADDR. ABORT
2817 034652  005267  023123              INC     60001           ;CAUSE ODD ADDRESS ABORT THRU LOC. 4
2818 034656  012706  001100      3$:     MOV     #KERSTK,KSP     ;RESTORE THE STACK POINTER
2819 034662  016702  135420              MOV     KIPDR3,R2       ;READ KIPDR3 INTO R2
2820 034666  020102                      CMP     R1,R2           ;WAS W-BIT LEFT CLEARED?
2821 034670  001401                      BEQ     4$              ;BRANCH IF YES
2822 034672  104057                      ERROR   +57             ;W-BIT GOT SET DURING AN ODD ADDR. ABORT
2823                                                             ;FOR TIGHTER SCOPE LOOP
2824                                                             ;REPLACE ERROR CALL WITH
2825                                                             ;'BR 2$'' = 000757
2826 034674  012767  003024  143102  4$: MOV     #TIMERR,ERRVEC  ;RESTORE NORMAL CPU TRAP ROUTINE TO LOC.4
2827 034702  012767  034622  144200      MOV     #1$,$LPERR      ;RESET LOOP ON ERROR POINTER TO 1$
2828 034710  004767  145312              JSR     PC,TON          ;TURN T-BIT TRAPPING BACK ON
```

```
                                .SBTTL  ************************************************************

                                .SBTTL  END OF PASS ROUTINE
                                ;;**********************************************************************
                                ;*INCREMENT THE PASS NUMBER ($PASS)
                                ;*TYPE 'END PASS #XXXXX TOTAL NUMBER OF ERRORS SINCE LAST REPORT YYYYY''
                                ;*WHERE XXXXX AND YYYYY ARE DECIMAL NUMBERS
                                ;*IF SW12=1 INHIBIT TRACE TRAP
                                ;*IF THERES A MONITOR GO TO IT
                                ;*IF THERE ISN'T JUMP TO LOOP
034714                          $EOP:
034714  000004                          SCOPE
034716  005067  144160                 CLR     $TSTNM          ;;ZERO THE TEST NUMBER
034722  005267  144304                 INC     $PASS           ;;INCREMENT THE PASS NUMBER
034726  042767  100000  144276        BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
034734  005327                          DEC     (PC)+           ;;LOOP?
034736  000001                  $EOPCT: .WORD   1
034740  003072                          BGT     $DOAGN          ;;YES
034742  012737                          MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
034744  000001                  $ENDCT: .WORD   1
034746  034736                          $EOPCT
034750  104401  034756                  TYPE    ,65$            ;;TYPE ASCIZ STRING
034754  000407                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <12><15>/END PASS #/
034774                          64$:
034774  016746  144232                 MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
                                                                ;;TYPE PASS NUMBER
035000  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
035002  104401  035010                  TYPE    ,67$            ;;TYPE ASCIZ STRING
035006  000421                          BR      66$             ;;GET OVER THE ASCIZ
                                ;;67$:  .ASCIZ  /  TOTAL ERRORS SINCE LAST REPORT /
035052                          66$:
035052  016746  144034                 MOV     $ERTTL,-(SP)    ;;SAVE $ERTTL FOR TYPEOUT
                                                                ;;TOTAL NUMBER OF ERRORS
035056  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
035060  104401  001221                  TYPE    ,$CRLF          ;;TYPE CARRIAGE RETURN, LINE FEED
035064  005067  144022                 CLR     $ERTTL          ;;CLEAR ERROR TOTAL
035070  013700  000042          $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
035074  001414                          BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
035076  005046                          CLR     -(SP)           ;;INSURE THE 'T' BIT IS CLEAR
035100  012746  035106                  MOV     #$CLR.T,-(SP)   ;;SETUP FOR AN RTI OR RTT
035104  000426                          BR      $RTRN           ;;GO DO AN RTI OR RTT TO LOAD THE PSW
                                                                ;;WITH A CLEARED 'T' BIT
035106                          $CLR.T:
035106  013700  000042                  MOV     @#42,R0         ;;INSURE R0 CONTAINS THE MONITORS
035112  001405                          BEQ     $DOAGN          ;;RETURN ADDRESS
035114  000005                          RESET                   ;;CLEAR THE WORLD
035116  004710                  $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
035120  000240                          NOP                     ;;SAVE ROOM
035122  000240                          NOP                     ;;FOR
035124  000240                          NOP                     ;;ACT11
035126                          $DOAGN:
035126  104400                          TRAP                    ;;PUSH OLD PSW AND PC ON STACK
035130  042716  000020                  BIC     #20,(SP)        ;;CLEAR THE 'T' BIT
035134  032777  010000  143776         BIT     #BIT12,@SWR     ;;RUN WITH TRACE TRAP?
035142  001005                          BNE     1$              ;;BR IF NO
035144  005167  144176                 COM     $TBIT           ;;IS IT TIME FOR TRACE TRAP
```

```
035150  100402                          BMI     1$                      ;;BR IF NO
035152  052716  000020                  BIS     #20,(SP)                ;;SET TRACE TRAP
035156  012746  035164          1$:     MOV     #$LOOP,-(SP)            ;;JUMP TO START OF TEST
035162  000002                  $RTRN:  RTI                             ;;RETURN--THIS IS CHANGED TO
                                                                        ;;AN 'RTT' IF 'RTT' IS A LEGAL
                                                                        ;;INSTRUCTION
035164                          $LOOP:
035164  000137                          JMP     @(PC)+                  ;;RETURN
035166  020456                  $RTNAD: .WORD   LOOP
035170     377     377     000  $ENULL: .BYTE   -1,-1,0                 ;;NULL CHARACTER STRING
                                        .EVEN
2833                            .SBTTL  SCOPE HANDLER ROUTINE
                                ;;**********************************************************************
                                ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
                                ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
                                ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW14=1         LOOP ON TEST
                                ;*SW09=1         LOOP ON ERROR
                                ;*SW08=1         LOOP ON TEST IN SWR<7:0>
                                ;*CALL
                                ;*      SCOPE           ;;SCOPE=IOT
035174                          $SCOPE:
035174  104410                          CKSWR                           ;;TEST  FOR CHANGE IN SOFT-SWR
035176  032777  040000  143734  1$:     BIT     #BIT14,@SWR             ;;LOOP ON PRESENT TEST?
035204  001062                          BNE     $OVER                   ;;YES IF SW14=1
                                ;#####START OF CODE FOR THE XOR TESTER#####
035206  000416                  $XTSTR: BR      6$                      ;;IF RUNNING ON THE 'XOR' TESTER CHANGE
                                                                        ;;THIS INSTRUCTION TO A 'NOP' (NOP=240)
035210  013746  000004                  MOV     @#ERRVEC,-(SP)          ;;SAVE THE CONTENTS OF THE ERROR VECTOR
035214  012737  035234  000004          MOV     #5$,@#ERRVEC            ;;SET FOR TIMEOUT
035222  005737  177060                  TST     @#177060                ;;TIME OUT ON XOR?
035226  012637  000004                  MOV     (SP)+,@#ERRVEC          ;;RESTORE THE ERROR VECTOR
035232  000431                          BR      $SVLAD                  ;;GO TO THE NEXT TEST
035234  022626                  5$:     CMP     (SP)+,(SP)+             ;;CLEAR THE STACK AFTER A TIME OUT
035236  012637  000004                  MOV     (SP)+,@#ERRVEC          ;;RESTORE THE ERROR VECTOR
035242  000417                          BR      7$                      ;;LOOP ON THE PRESENT TEST
035244                          6$:;#####END OF CODE FOR THE XOR TESTER#####
035244  032777  000400  143666          BIT     #BIT08,@SWR             ;;LOOP ON SPEC. TEST?
035252  001404                          BEQ     2$                      ;;BR IF NO
035254  127767  143660  143620          CMPB    @SWR,$TSTNM             ;;ON THE RIGHT TEST?    SWR<7:0>
035262  001433                          BEQ     $OVER                   ;;BR IF YES
035264  105767  143613          2$:     TSTB    $ERFLG                  ;;HAS AN ERROR OCCURRED?
035270  001412                          BEQ     $SVLAD                  ;;BR IF NO
035272  032777  001000  143640          BIT     #BIT09,@SWR             ;;LOOP ON ERROR?
035300  001404                          BEQ     4$                      ;;BR IF NO
035302  016767  143602  143576  7$:     MOV     $LPERR,$LPADR           ;;SET LOOP ADDRESS TO LAST SCOPE
035310  000420                          BR      $OVER
035312  105067  143565          4$:     CLRB    $ERFLG                  ;;ZERO THE ERROR FLAG
035316  105267  143560          $SVLAD: INCB    $TSTNM                  ;;COUNT TEST NUMBERS
035322  116767  143554  143700          MOVB    $TSTNM,$TESTN           ;;SET TEST NUMBER IN APT MAILBOX
035330  011667  143552                  MOV     (SP),$LPADR             ;;SAVE SCOPE LOOP ADDRESS
035334  011667  143550                  MOV     (SP),$LPERR             ;;SAVE ERROR LOOP ADDRESS
035340  005067  143646                  CLR     $ESCAPE                 ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
035344  112767  000001  143543          MOVB    #1,$ERMAX               ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
035352  016777  143524  143562  $OVER:  MOV     $TSTNM,@DISPLAY         ;;DISPLAY TEST NUMBER
035360  016716  143522                  MOV     $LPADR,(SP)             ;;FUDGE RETURN ADDRESS
```

```
035364  000002                          RTI                     ;;FIXES PS
2834                            .SBTTL  ERROR HANDLER ROUTINE
                                ;;**********************************************************************
                                ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
                                ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
                                ;*AND GO TO ERRTYP ON ERROR
                                ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
                                ;*SW15=1         HALT ON ERROR
                                ;*SW13=1         INHIBIT ERROR TYPEOUTS
                                ;*SW10=1         BELL ON ERROR
                                ;*SW09=1         LOOP ON ERROR
                                ;*CALL
                                ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
035366                          $ERROR:
035366  104410                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
035370  010067  143566                  MOV     R0,$REG0        ;SAVE THE CONTENTS OF R0
035374  010167  143564                  MOV     R1,$REG1        ;SAVE THE CONTENTS OF R1
035400  010267  143562                  MOV     R2,$REG2        ;SAVE THE CONTENTS OF R2
035404  010367  143560                  MOV     R3,$REG3        ;SAVE THE CONTENTS OF R3
035410  010467  143556                  MOV     R4,$REG4        ;SAVE THE CONTENTS OF R4
035414  010567  143554                  MOV     R5,$REG5        ;SAVE THE CONTENTS OF R5
035420  116767  143456  143626          MOVB    $TSTNM,TESTNO   ;SAVE THE TEST NUMBER
035426  105267  143451          7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
035432  001775                          BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
035434  016777  143442  143500          MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
035442  032777  002000  143470          BIT     #BIT10,@SWR     ;;BELL ON ERROR?
035450  001402                          BEQ     1$              ;;NO - SKIP
035452  104401  001214                  TYPE    ,$BELL          ;;RING BELL
035456  005267  143430          1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
035462  011667  143430                  MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
035466  162767  000002  143422          SUB     #2,$ERRPC
035474  117767  143416  143412          MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
035502  032777  020000  143430          BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
035510  001004                          BNE     20$             ;;SKIP TYPEOUTS
035512  004767  000106                  JSR     PC,ERRTYP       ;;GO TO USER ERROR ROUTINE
035516  104401  001221                  TYPE    ,$CRLF
035522                          20$:
035522  122767  000001  143514          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
035530  001007                          BNE     2$              ;;NO,SKIP APT ERROR REPORT
035532  116767  143356  000004          MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
035540  004767  002032                  JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
035544     000                  21$:    .BYTE   0
035545     000                          .BYTE   0
035546  000777                  22$:    BR      22$             ;;APT ERROR LOOP
035550  005777  143364          2$:     TST     @SWR            ;;HALT ON ERROR
035554  100002                          BPL     3$              ;;SKIP IF CONTINUE
035556  000000                          HALT                    ;;HALT ON ERROR!
035560  104410                          CKSWR                   ;;TEST FOR CHANGE IN SOFT-SWR
035562  032777  001000  143350  3$:     BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
035570  001402                          BEQ     4$              ;;BR IF NO
035572  016716  143312                  MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
035576  005767  143410          4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
035602  001402                          BEQ     5$              ;;BR IF NONE
035604  016716  143402                  MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
035610                          5$:
035610  022737  035116  000042          CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
035616  001001                          BNE     6$              ;;BRANCH IF NO
```

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        035620  000000                          HALT                    ;;YES
        035622                          6$:
        035622  000002                          RTI                     ;;RETURN
  2835
  2836 035624  104401  001221          ERRTYP: TYPE    ,$CRLF          ;''CARRIAGE RETURN'' & 'LINE FEED''
  2837 035630  010046                          MOV     R0,-(KSP)       ;SAVE R0.
  2838 035632  005000                          CLR     R0              ;PICKUP THE ITEM INDEX
  2839 035634  153700  001114                  BISB    @#$ITEMB,R0
  2840 035640  001004                          BNE     1$              ;IF ITEM NUMBER IS ZERO, JUST
  2841                                                                  ;TYPE THE PC OF THE ERROR
  2842 035642  016746  143250                  MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
  2843                                                                  ;;ERROR ADDRESS
  2844 035646  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
  2845 035650  000522                          BR      13$             ;GET OUT
  2846 035652  005300                  1$:     DEC     R0              ;ADJUST THE INDEX SO THAT IT WILL
  2847 035654  006300                          ASL     R0              ;WORK FOR THE ERROR TABLE.
  2848 035656  006300                          ASL     R0
  2849 035660  006300                          ASL     R0
  2850 035662  062700  001372                  ADD     #$ERRTB,R0      ;FORM TABLE POINTER
  2851 035666  012067  000004                  MOV     (R0)+,2$        ;PICKUP ''ERROR MESSAGE'' POINTER
  2852 035672  001404                          BEQ     3$              ;SKIP TYPEOUT IF NO POINTER
  2853 035674  104401                          TYPE                    ;TYPE THE ''ERROR MESSAGE''
  2854 035676  000000                  2$:     .WORD   0               ;''ERROR MESSAGE'' POINTER GOES HERE
  2855 035700  104401  001221                  TYPE    ,$CRLF          ;''CARRIAGE RETURN'' & 'LINE FEED''
  2856 035704  012067  000004          3$:     MOV     (R0)+,4$        ;PICKUP ''DATA HEADER'' POINTER
  2857 035710  001404                          BEQ     5$              ;SKIP TYPEOUT IF 0
  2858 035712  104401                          TYPE                    ;TYPE THE ''DATA HEADER''
  2859 035714  000000                  4$:     .WORD   0               ;''DATA HEADER'' POINTER GOES HERE
  2860 035716  104401  001221                  TYPE    ,$CRLF          ;''CARRIAGE RETURN'' & 'LINE FEED''
  2861 035722  010146                  5$:     MOV     R1,-(KSP)       ;SAVE R1
  2862 035724  012001                          MOV     (R0)+,R1        ;PICKUP ''DATA TABLE'' POINTER
  2863 035726  001472                          BEQ     12$             ;BR IF NO DATA TO BE TYPED
  2864 035730  012000                          MOV     (R0)+,R0        ;PICKUP ''DATA FORMAT'' POINTER
  2865 035732  105710                  6$:     TSTB    (R0)            ;IS IT FORMAT 0?
  2866 035734  001003                          BNE     7$              ;BR IF NO
  2867                                  ;*THIS CODE IS FOR OCTAL (16-BIT) FORMAT (DF=0)
  2868 035736  013146                          MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FPR TYPEOUT
  2869 035740  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
  2870 035742  000456                          BR      11$
  2871                                  ;*THIS CODE IS FOR DECIMAL FORMAT (DF=1)
  2872 035744  121027  000001          7$:     CMPB    (R0),#1         ;IS IT FORMAT 1?
  2873 035750  001003                          BNE     8$              ;BRANCH IF NO
  2874 035752  013146                          MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
  2875 035754  104405                          TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
  2876 035756  000450                          BR      11$
  2877                                  ;*THIS CODE IS FOR BINARY FORMAT (DF=2)
  2878 035760  121027  000002          8$:     CMPB    (R0),#2         ;IS IT FORMAT 2
  2879 035764  001003                          BNE     9$              ;BRANCH IF NO
  2880 035766  013146                          MOV     @(R1)+,-(SP)    ;;SAVE @(R1)+ FOR TYPEOUT
  2881 035770  104406                          TYPBN                   ;;GO TYPE--BINARY ASCII
  2882 035772  000442                          BR      11$
  2883                                  ;*THIS CODE IS FOR OCTAL (22-BIT) FORMAT (DF=3)
  2884 035774  121027  000003          9$:     CMPB    (R0),#3         ;IS IT FORMAT 3?
  2885 036000  001011                          BNE     15$             ;BRANCH IF NO
  2886 036002  012146                          MOV     (R1)+,-(KSP)    ;PUT ADDRESS OF FIRST LOC. ON STACK
  2887 036004  004767  002640                  JSR     PC,$DB20        ;CONVERT TWO LOCS. TO AN ASCII STRING
  2888 036010  062716  000003                  ADD     #3,(KSP)        ;ONLY NEED 8 CHARACTERS NOT 11
```

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2889 036014  012667  000002                    MOV     (KSP)+,10$      ;PUT ADDRESS OF ASCII CHARS. AT 10$
2890 036020  104401                            TYPE                    ;TYPE OCTAL VALUE OF 22-BIT BINARY NO.
2891 036022  000000                  10$:      .WORD   0
2892                                 ;*THIS CODE IS FOR OCTAL (22-BIT) FORMAT FOR A PAR LEFT SHIFTED 6 (DF=4)
2893 036024  010246                  15$:      MOV     R2,-(KSP)       ;SAVE R2 ON STACK
2894 036026  010346                            MOV     R3,-(KSP)       ;SAVE R3 ON STACK
2895 036030  013103                            MOV     @(R1)+,R3       ;LOAD DATA WORD INTO R3
2896 036032  005002                            CLR     R2              ;R2 HOLDS UPPER SIX BITS OF NUMBER
2897 036034  073227  000006                    ASHC    #6,R2           ;SHIFT VALUE LEFT 6 TIMES
2898 036040  010267  143142                    MOV     R2,$TMP4        ;HOLDS LOWER 16 BITS OF ADDRESS
2899 036044  010367  143140                    MOV     R3,$TMP5        ;HOLDS UPPER 6 BITS OF ADDRESS
2900 036050  012746  001206                    MOV     #$TMP4,-(KSP)   ;PUT ADDRESS OF LOWER BITS ONTO STACK
2901 036054  004767  002570                    JSR     PC,$DB2O        ;CONVERT TWO LOCS. TO AN ASCII STRING
2902 036060  062716  000003                    ADD     #3,(KSP)        ;ONLY NEED 8 CHARACTERS NOT 11
2903 036064  012667  000002                    MOV     (KSP)+,16$      ;PUT ADDRESS OF ASCII CHARS. AT 16$
2904 036070  104401                            TYPE                    ;TYPE OCTAL VALUE OF 22-BIT BINARY NO.
2905 036072  000000                  16$:      .WORD   0
2906 036074  012603                            MOV     (KSP)+,R3       ;RESTORE R3
2907 036076  012602                            MOV     (KSP)+,R2       ;RESTORE R2
2908 036100  005711                  11$:      TST     (R1)            ;IS THERE ANOTHER NUMBER?
2909 036102  001404                            BEQ     12$             ;BR IF NO
2910 036104  104401  036126                    TYPE    ,14$            ;TYPE TWO(2) SPACES
2911 036110  105720                            TSTB    (R0)+           ;POINT TO NEW 'DATA FORMAT'
2912 036112  000707                            BR      6$              ;LOOP
2913 036114  012601                  12$:      MOV     (KSP)+,R1       ;RESTORE R1
2914 036116  012600                  13$:      MOV     (KSP)+,R0       ;RESTORE R0
2915 036120  104401  001221                    TYPE    ,$CRLF          ;'CARRIAGE RETURN' & 'LINE FEED'
2916 036124  000207                            RTS     PC              ;RETURN
2917 036126     040     040     000  14$:      .ASCIZ  /  /            ;TWO(2) SPACES
2918 036131     000                            .BYTE   0
2919
2920                                 .SBTTL  TTY INPUT ROUTINE
                                     ;;*********************************************************************
                                     .ENABL  LSB
                                     ;;*********************************************************************
                                     ;*SOFTWARE SWITCH REGISTER CHANGE ROUTINE.
                                     ;*ROUTINE IS ENTERED FROM THE TRAP HANDLER, AND WILL
                                     ;*SERVICE THE TEST FOR CHANGE IN SOFTWARE SWITCH REGISTER TRAP CALL
                                     ;*WHEN OPERATING IN TTY FLAG MODE.
036132  022767  000176  143000  $CKSWR: CMP     #SWREG,SWR      ;;IS THE SOFT-SWR SELECTED?
036140  001114                          BNE     15$             ;;BRANCH IF NO
036142  105777  142776                  TSTB    @$TKS           ;;CHAR THERE?
036146  100111                          BPL     15$             ;;IF NO, DON'T WAIT AROUND
036150  117746  142772                  MOVB    @$TKB,-(SP)     ;;SAVE THE CHAR
036154  042716  177600                  BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
036160  022726  000007                  CMP     #7,(SP)+        ;;IS IT A CONTROL G?
036164  001102                          BNE     15$             ;;NO, RETURN TO USER
036166  126727  142742  000001          CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
036174  001476                          BEQ     15$             ;;BRANCH IF YES
036176  104401  037067                  TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
036202  104401  037074          $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
036206  016746  141764                  MOV     SWREG,-(SP)     ;;SAVE SWREG FOR TYPEOUT
036212  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
036214  104401  037105                  TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
036220  005046                  19$:    CLR     -(SP)           ;;CLEAR COUNTER
036222  005046                          CLR     -(SP)           ;;THE NEW SWR
036224  105777  142714          7$:     TSTB    @$TKS           ;;CHAR THERE?
```

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036230  100375                          BPL     7$              ;;IF NOT TRY AGAIN
036232  117746  142710                  MOVB    @$TKB,-(SP)     ;;PICK UP CHAR
036236  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
036242  021627  000003                  CMP     (SP),#3         ;;IS IT A CONTROL-C?
036246  001015                          BNE     9$              ;;BRANCH IF NOT
036250  104401  001350                  TYPE    ,$CNTLC         ;;YES, ECHO CONTROL-C (^C)
036254  062706  000006                  ADD     #6,SP           ;;CLEAN UP STACK
036260  126727  142651  000001          CMPB    $INTAG,#1       ;;REENABLE TTY KEYBOARD INTERRUPTS?
036266  001003                          BNE     8$              ;;BRANCH IF NO
036270  012777  000100  142646          MOV     #100,@$TKS      ;;ALLOW TTY KEYBOARD INTERRUPTS
036276  000167  000614          8$:     JMP     CNTRLC          ;;CONTROL-C RESTART
036302  021627  000025          9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
036306  001005                          BNE     10$             ;;BRANCH IF NOT
036310  104401  037062                  TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
036314  062706  000006          20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
036320  000737                          BR      19$             ;;LET'S TRY IT AGAIN
036322  021627  000015          10$:    CMP     (SP),#15        ;;IS IT A <CR>?
036326  001022                          BNE     16$             ;;BRANCH IF NO
036330  005766  000004                  TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
036334  001403                          BEQ     11$             ;;BRANCH IF YES
036336  016677  000002  142574          MOV     2(SP),@SWR      ;;SAVE NEW SWR
036344  062706  000006          11$:    ADD     #6,SP           ;;CLEAR UP STACK
036350  104401  001221          14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
036354  126727  142555  000001          CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
036362  001003                          BNE     15$             ;;BRANCH IF NOT
036364  012777  000100  142552          MOV     #100,@$TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
036372  000002          15$:    RTI                             ;;RETURN
036374  004767  001040          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
036400  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
036404  002420                          BLT     18$             ;;BRANCH IF YES
036406  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
036412  003015                          BGT     18$             ;;BRANCH IF YES
036414  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
036420  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
036424  001403                          BEQ     17$             ;;BRANCH IF YES
036426  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
036430  006316                          ASL     (SP)            ;;    CHAR OVER TO MAKE
036432  006316                          ASL     (SP)            ;;    ROOM FOR NEW ONE.
036434  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
036440  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
036444  000667                          BR      7$              ;;GET THE NEXT ONE
036446  104401  001220          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
036452  000720                          BR      20$             ;;SIMULATE CONTROL-U
                        .DSABL  LSB
                        ;;*****************************************************************************
                        ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                        ;*CALL:
                        ;*      RDCHR                           ;;INPUT A SINGLE CHARACTER FROM THE TTY
                        ;*      RETURN HERE                     ;;CHARACTER IS ON THE STACK
                        ;*                                      ;;WITH PARITY BIT STRIPPED OFF
                        ;
036454  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
036456  016666  000004  000002          MOV     4(SP),2(SP)     ;;SAVE THE PS
036464  105777  142454          1$:     TSTB    @$TKS           ;;WAIT FOR
036470  100375                          BPL     1$              ;;A CHARACTER
036472  117766  142450  000004          MOVB    @$TKB,4(SP)     ;;READ THE TTY
036500  042766  177600  000004          BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
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036506  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
036514  001013                          BNE     3$              ;;BRANCH IF NO
036516  105777  142422          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
036522  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
036524  117746  142416                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
036530  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
036534  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
036540  001366                          BNE     2$              ;;IF NOT DISCARD IT
036542  000750                          BR      1$              ;;YES, RESUME
036544  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
036552  002407                          BLT     4$              ;;BRANCH IF YES
036554  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
036562  003003                          BGT     4$              ;;BRANCH IF YES
036564  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
036572  000002                  4$:     RTI                     ;;GO BACK TO USER
                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                                ;*CALL:
                                ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                                ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                                ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
036574  010346                  $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
036576  005046                          CLR     -(SP)           ;;CLEAR THE RUBOUT KEY
036600  012703  037052          1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
036604  022703  037062          2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
036610  101467                          BLOS    4$              ;;BR IF YES
036612  104411                          RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
036614  112613                          MOVB    (SP)+,(R3)      ;;GET CHARACTER
036616  122713  000003                  CMPB    #3,(R3)         ;;IS IT A CONTROL-C?
036622  001006                          BNE     10$             ;;BRANCH IF NO
036624  104401  001350                  TYPE    ,$CNTLC         ;;TYPE A CONTROL-C (^C)
036630  005726                          TST     (SP)+           ;;CLEAN RUBOUT KEY OFF OF THE STACK
036632  012603                          MOV     (SP)+,R3        ;;RESTORE R3
036634  000167  000256                  JMP     CNTRLC          ;;GOTO CONTROL-C RESTART
036640  122713  000177          10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
036644  001022                          BNE     5$              ;;BR IF NO
036646  005716                          TST     (SP)            ;;IS THIS THE FIRST RUBOUT?
036650  001007                          BNE     6$              ;;BR IF NO
036652  112767  000134  000170          MOVB    #'\,9$          ;;TYPE A BACK SLASH
036660  104401  037050                  TYPE    ,9$
036664  012716  177777                  MOV     #-1,(SP)        ;;SET THE RUBOUT KEY
036670  005303                  6$:     DEC     R3              ;;BACKUP BY ONE
036672  020327  037052                  CMP     R3,#$TTYIN      ;;STACK EMPTY?
036676  103434                          BLO     4$              ;;BR IF YES
036700  111367  000144                  MOVB    (R3),9$         ;;SETUP TO TYPEOUT THE DELETED CHAR.
036704  104401  037050                  TYPE    ,9$             ;;GO TYPE
036710  000735                          BR      2$              ;;GO READ ANOTHER CHAR.
036712  005716                  5$:     TST     (SP)            ;;RUBOUT KEY SET?
036714  001406                          BEQ     7$              ;;BR IF NO
036716  112767  000134  000124          MOVB    #'\,9$          ;;TYPE A BACK SLASH
036724  104401  037050                  TYPE    ,9$
036730  005016                          CLR     (SP)            ;;CLEAR THE RUBOUT KEY
036732  122713  000025          7$:     CMPB    #25,(R3)        ;;IS CHARACTER A CTRL U?
036736  001003                          BNE     8$              ;;BR IF NO
036740  104401  037062                  TYPE    ,$CNTLU         ;;TYPE A CONTROL 'U''
036744  000715                          BR      1$              ;;GO START OVER
036746  122713  000022          8$:     CMPB    #22,(R3)        ;;IS CHARACTER A ''^R''?
```

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036752  001011                          BNE     3$              ;;BRANCH IF NO
036754  105013                          CLRB    (R3)            ;;CLEAR THE CHARACTER
036756  104401  001221                  TYPE    ,$CRLF          ;;TYPE A ''CR'' & 'LF''
036762  104401  037052                  TYPE    ,$TTYIN         ;;TYPE THE INPUT STRING
036766  000706                          BR      2$              ;;GO PICKUP ANOTHER CHACTER
036770  104401  001220          4$:     TYPE    ,$QUES          ;;TYPE A '?'
036774  000701                          BR      1$              ;;CLEAR THE BUFFER AND LOOP
036776  111367  000046          3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
037002  104401  037050                  TYPE    ,9$
037006  122723  000015                  CMPB    #15,(R3)+       ;;CHECK FOR RETURN
037012  001274                          BNE     2$              ;;LOOP IF NOT RETURN
037014  105063  177777                  CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
037020  104401  001222                  TYPE    ,$LF            ;;TYPE A LINE FEED
037024  005726                          TST     (SP)+           ;;CLEAN RUBOUT KEY FROM THE STACK
037026  012603                          MOV     (SP)+,R3        ;;RESTORE R3
037030  011646                          MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
037032  016666  000004  000002          MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
037040  012766  037052  000004          MOV     #$TTYIN,4(SP)
037046  000002                          RTI                     ;;RETURN
037050     000                  9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
037051     000                          .BYTE   0               ;;TERMINATOR
037052                          $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
037062     136     125     015  $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U'
037065     012     000
037067     136     107     015  $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL ''G''
037072     012     000
037074     015     012     123  $MSWR:  .ASCIZ  <15><12>/SWR = /
037077     127     122     040
037102     075     040     000
037105     040     040     116  $MNEW:  .ASCIZ  /  NEW = /
037110     105     127     040
037113     075     040     000
2921
2922                                .SBTTL  CONTROL-C SERVICING ROUTINE
2923
2924 037116  016767  142110  142064  CNTRLC: MOV     $PASS,$TMP5     ;GET THE VALUE OF ''$PASS''
2925 037124  005267  142060                  INC     $TMP5           ;FORM CURRENT PASS #
2926 037130  104401  037175                  TYPE    ,CMSG           ;TYPE THE TEST STOPS HERE
2927 037134  116767  141742  000026          MOVB    $TSTNM,1$       ;SAVE TEST NUMBER
2928 037142  016746  000022                  MOV     1$,-(SP)        ;SAVE 1$ FO TYPEOUT
2929 037146  104402                          TYPOC
2930 037150  104401  037172                  TYPE    ,2$
2931 037154  016746  142030                  MOV     $TMP5,-(SP)     ;SAVE $TMP5 FOR TYPEOUT
2932 037160  104405                          TYPDS                   ;TYPE ASCII DECIMAL WITH SIGN
2933 037162  104407                          GTSWR                   ;ASK FOR NEW SWR VALUE
2934 037164  000167  175526                  JMP     $EOP+2          ;JUMP TO END OF PASS + 2
2935 037170  000000                  1$:     .WORD   0               ;TEST # BUFFER
2936 037172     040     040     000  2$:     .ASCIZ  /  /            ;2 SPACES & STOP MESSAGE
2937 037175     112     125     115  CMSG:   .ASCII  /JUMPING TO END OF PASS/<15><12>
     037200     120     111     116
     037203     107     040     124
     037206     117     040     105
     037211     116     104     040
     037214     117     106     040
     037217     120     101     123
     037222     123     015     012
2938 037225     000                          .BYTE   0
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2939                                    .SBTTL  TYPE ROUTINE
                                        ;;*****************************************************************
                                        ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
                                        ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
                                        ;*NOTE1:         $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
                                        ;*NOTE2:         $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
                                        ;*NOTE3:         $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
                                        ;*
                                        ;*CALL:
                                        ;*1) USING A TRAP INSTRUCTION
                                        ;*       TYPE    ,MESADR          ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
                                        ;*OR
                                        ;*       TYPE
                                        ;*       MESADR
                                        ;*
037226  105767  141725          $TYPE:  TSTB    $TPFLG           ;;IS THERE A TERMINAL?
037232  100002                          BPL     1$               ;;BR IF YES
037234  000000                          HALT                     ;;HALT HERE IF NO TERMINAL
037236  000430                          BR      3$               ;;LEAVE
037240  010046                  1$:     MOV     R0,-(SP)         ;;SAVE R0
037242  017600  000002                  MOV     @2(SP),R0        ;;GET ADDRESS OF ASCIZ STRING
037246  122767  000001  141770          CMPB    #APTENV,$ENV     ;;RUNNING IN APT MODE
037254  001011                          BNE     62$              ;;NO,GO CHECK FOR APT CONSOLE
037256  132767  000100  141761          BITB    #APTSPOOL,$ENVM  ;;SPOOL MESSAGE TO APT
037264  001405                          BEQ     62$              ;;NO,GO CHECK FOR CONSOLE
037266  010067  000004                  MOV     R0,61$           ;;SETUP MESSAGE ADDRESS FOR APT
037272  004767  000270                  JSR     PC,$ATY3         ;;SPOOL MESSAGE TO APT
037276  000000                  61$:    .WORD   0                ;;MESSAGE ADDRESS
037300  132767  000040  141737  62$:    BITB    #APTCSUP,$ENVM   ;;APT CONSOLE SUPPRESSED
037306  001003                          BNE     60$              ;;YES,SKIP TYPE OUT
037310  112046                  2$:     MOVB    (R0)+,-(SP)      ;;PUSH CHARACTER TO BE TYPED ONTO STACK
037312  001005                          BNE     4$               ;;BR IF IT ISN'T THE TERMINATOR
037314  005726                          TST     (SP)+            ;;IF TERMINATOR POP IT OFF THE STACK
037316  012600                  60$:    MOV     (SP)+,R0         ;;RESTORE R0
037320  062716  000002          3$:     ADD     #2,(SP)          ;;ADJUST RETURN PC
037324  000002                          RTI                      ;;RETURN
037326  122716  000011          4$:     CMPB    #HT,(SP)         ;;BRANCH IF <HT>
037332  001430                          BEQ     8$
037334  122716  000200                  CMPB    #CRLF,(SP)       ;;BRANCH IF NOT <CRLF>
037340  001006                          BNE     5$
037342  005726                          TST     (SP)+            ;;POP  <CR><LF> EQUIV
037344  104401                          TYPE                     ;;TYPE A CR AND LF
037346  001221                          $CRLF
037350  105067  000200                  CLRB    $CHARCNT         ;;CLEAR CHARACTER COUNT
037354  000755                          BR      2$               ;;GET NEXT CHARACTER
037356  004767  000056          5$:     JSR     PC,$TYPEC        ;;GO TYPE THIS CHARACTER
037362  126726  141570          6$:     CMPB    $FILLC,(SP)+     ;;IS IT TIME FOR FILLER CHARS.?
037366  001350                          BNE     2$               ;;IF NO GO GET NEXT CHAR.
037370  016746  141560                  MOV     $NULL,-(SP)      ;;GET # OF FILLER CHARS. NEEDED
                                                                 ;;AND THE NULL CHAR.
037374  105366  000001          7$:     DECB    1(SP)            ;;DOES A NULL NEED TO BE TYPED?
037400  002770                          BLT     6$               ;;BR IF NO--GO POP THE NULL OFF OF STACK
037402  004767  000032                  JSR     PC,$TYPEC        ;;GO TYPE A NULL
037406  105367  000142                  DECB    $CHARCNT         ;;DO NOT COUNT AS A COUNT
037412  000770                          BR      7$               ;;LOOP
                                        ;HORIZONTAL TAB PROCESSOR
037414  112716  000040          8$:     MOVB    #' ,(SP)         ;;REPLACE TAB WITH SPACE
```

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037420  004767  000014          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
037424  132767  000007  000122          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
037432  001372                          BNE     9$              ;;TAB STOP
037434  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
037436  000724                          BR      2$              ;;GET NEXT CHARACTER
037440  105777  141504          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
037444  100375                          BPL     $TYPEC
037446  116677  000002  141476          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
037454  105777  141464                  TSTB    @$TKS           ;;SEE IF KEYBOARD IS TALKING.
037460  100021                          BPL     2$              ;;BRANCH IF IT ISN'T.
037462  017746  141460                  MOV     @$TKB,-(SP)     ;;PUSH CHARACTER ONTO STACK.
037466  042716  177600                  BIC     #177600,(SP)    ;;BIT CLEAR TOP BYTE AND PARITY BIT.
037472  022726  000023                  CMP     #23,(SP)+       ;;SEE IF THIS IS A ^S.
037476  001012                          BNE     2$              ;;BRANCH TO CONTINUE IF IT ISN'T.
037500  105777  141440          3$:     TSTB    @$TKS           ;;WAIT FOR ANOTHER INPUT.
037504  100375                          BPL     3$              ;;BRANCH BACK IF NOT READY.
037506  017746  141434                  MOV     @$TKB,-(SP)     ;;PUSH NEXT CHARACTER ON STACK.
037512  042716  177600                  BIC     #177600,(SP)    ;;BIT CLEAR TOP BYTE AND PARITY BIT.
037516  022726  000021                  CMP     #21,(SP)+       ;;SEE IF THIS IS A ^Q.
037522  001366                          BNE     3$              ;;BRANCH BACK FOR MORE WAIT IF NOT.
037524  122766  000015  000002  2$:     CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
037532  001003                          BNE     1$              ;;BRANCH IF NO
037534  105067  000014                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
037540  000406                          BR      $TYPEX          ;;EXIT
037542  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
037550  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
037552  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
037554  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
037556  000207          $TYPEX: RTS     PC
  2940                  .SBTTL  APT COMMUNICATIONS ROUTINE
                        ;;**************************************************************
037560  112767  000001  000236  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
037566  112767  000001  000226  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
037574  000403                          BR      $ATYC
037576  112767  000001  000220  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
037604                          $ATYC:
037604  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
037606  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
037610  105767  000206                  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
037614  001450                          BEQ     5$              ;;IF NOT:  BR
037616  122767  000001  141420          CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
037624  001031                          BNE     3$              ;;IF NOT:  BR
037626  132767  000100  141411          BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
037634  001425                          BEQ     3$              ;;IF NOT:  BR
037636  017600  000004                  MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
037642  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037650  005767  141350          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
037654  001375                          BNE     1$              ;;IF NOT:  WAIT
037656  010067  141356                  MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
037662  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
037664  001376                          BNE     2$
037666  166700  141346                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
037672  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
037674  010067  141342                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
037700  012767  000004  141316          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
037706  000413                          BR      5$
037710  017667  000004  000016  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
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037716  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
037724  016746  140046                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
037730  004767  177272                  JSR     PC,$TYPE        ;;CALL TYPE MACRO
037734  000000                  4$:     .WORD   0
037736                          5$:
037736  105767  000062          10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
037742  001416                          BEQ     12$             ;;IF NOT:  BR
037744  005767  141274                  TST     $ENV            ;;RUNNING UNDER APT?
037750  001413                          BEQ     12$             ;;IF NOT:  BR
037752  005767  141246          11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
037756  001375                          BNE     11$             ;;IF NOT:  WAIT
037760  017667  000004  141240          MOV     @4(SP),$FATAL   ;;GET ERROR #
037766  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
037774  005267  141224                  INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
040000  105067  000020          12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
040004  105067  000013                  CLRB    $LFLG           ;;CLEAR LOG FLAG
040010  105067  000006                  CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
040014  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
040016  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
040020  000207                          RTS     PC              ;;RETURN
040022     000          $MFLG:  .BYTE   0               ;;MESSG. FLAG
040023     000          $LFLG:  .BYTE   0               ;;LOG FLAG
040024     000          $FFLG:  .BYTE   0               ;;FATAL FLAG
                                .EVEN
            000200          APTSIZE=200
            000001          APTENV=001
            000100          APTSPOOL=100
            000040          APTCSUP=040
2941                        .SBTTL  BINARY TO ASCII AND TYPE ROUTINE
                            ;;**********************************************************************
                            ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 16-BIT
                            ;*BINARY-ASCII NUMBER AND TYPE IT.
                            ;*CALL:
                            ;*      MOV     NUMBER,-(SP)    ;;NUMBER TO BE TYPED
                            ;*      TYPBN                   ;;TYPE IT
040026  010146          $TYPBN: MOV     R1,-(SP)                ;;SAVE R1 ON THE STACK
040030  016601  000006          MOV     6(SP),R1                ;;GET THE INPUT NUMBER
040034  000261                  SEC                             ;;SET "C" SO CAN KEEP TRACK OF THE NUMBER OF BITS
040036  112767  000060  000034  1$:     MOVB    #'0,$BIN                ;;SET CHARACTER TO AN ASCII '0'.
040044  006101                  ROL     R1                      ;;GET THIS BIT
040046  001406                  BEQ     2$                      ;;DONE?
040050  105567  000024                  ADCB    $BIN                    ;;NO--SET THE CHARACTER EQUAL TO THIS BIT
040054  104401  040100                  TYPE    ,$BIN                   ;;GO TYPE THIS BIT
040060  000241                  CLC                             ;;CLEAR "C" SO CAN KEEP TRACK OF BITS
040062  000765                  BR      1$                      ;;GO DO THE NEXT BIT
040064  012601          2$:     MOV     (SP)+,R1                ;;POP THE STACK INTO R1
040066  016666  000002  000004          MOV     2(SP),4(SP)             ;;ADJUST THE STACK
040074  012616                  MOV     (SP)+,(SP)
040076  000002                  RTI                             ;;RETURN TO USER
040100     000     000          $BIN:   .BYTE   0,0             ;;STORAGE FOR ASCII CHAR. AND TERMINATOR
2942                        .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE
                            ;;**********************************************************************
                            ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                            ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                            ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                            ;*CALL:
                            ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
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```
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M=1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                ;*$TYPOS OR $TYPOC
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPON                   ;;CALL FOR TYPEOUT
                                ;*
                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOC                   ;;CALL FOR TYPEOUT
040102  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
040106  116667  000001  000211          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
040114  112667  000207                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
040120  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
040124  000406                          BR      $TYPON
040126  112767  000001  000171  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
040134  112767  000006  000165          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
040142  112767  000005  000154  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
040150  010346                          MOV     R3,-(SP)        ;;SAVE R3
040152  010446                          MOV     R4,-(SP)        ;;SAVE R4
040154  010546                          MOV     R5,-(SP)        ;;SAVE R5
040156  116704  000145                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
040162  005404                          NEG     R4
040164  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
040170  110467  000132                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
040174  116704  000125                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
040200  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
040204  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
040206  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
040210  000404                          BR      3$              ;;GO DO MSB
040212  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
040214  006105                          ROL     R5
040216  006105                          ROL     R5
040220  010503                          MOV     R5,R3
040222  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
040224  105367  000076                  DECB    $OMODE          ;;TYPE THIS DIGIT?
040230  100016                          BPL     7$              ;;BR IF NO
040232  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
040236  001002                          BNE     4$              ;;TEST FOR 0
040240  005704                          TST     R4              ;;SUPPRESS THIS 0?
040242  001403                          BEQ     5$              ;;BR IF YES
040244  005204                  4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
040246  052703  000060                  BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
040252  052703  000040          5$:     BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
040256  110367  000040                  MOVB    R3,8$           ;;SAVE FOR TYPING
040262  104401  040322                  TYPE    ,8$             ;;GO TYPE THIS DIGIT
040266  105367  000032  7$:     DECB    $OCNT           ;;COUNT BY 1
040272  003347                          BGT     2$              ;;BR IF MORE TO DO
040274  002402                          BLT     6$              ;;BR IF DONE
040276  005204                          INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
040300  000744                          BR      2$              ;;GO DO THE LAST DIGIT
```

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040302  012605                  6$:     MOV     (SP)+,R5        ;;RESTORE R5
040304  012604                          MOV     (SP)+,R4        ;;RESTORE R4
040306  012603                          MOV     (SP)+,R3        ;;RESTORE R3
040310  016666  000002  000004          MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
040316  012616                          MOV     (SP)+,(SP)
040320  000002                          RTI                     ;;RETURN
040322     000                  8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
040323     000                          .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
040324     000                  $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
040325     000                  $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
040326  000000                  $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
  2943                          .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
040330                        $TYPDS:
040330  010046                         MOV     R0,-(SP)        ;;PUSH R0 ON STACK
040332  010146                         MOV     R1,-(SP)        ;;PUSH R1 ON STACK
040334  010246                         MOV     R2,-(SP)        ;;PUSH R2 ON STACK
040336  010346                         MOV     R3,-(SP)        ;;PUSH R3 ON STACK
040340  010546                         MOV     R5,-(SP)        ;;PUSH R5 ON STACK
040342  012746  020200                 MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
040346  016605  000020                 MOV     20(SP),R5       ;;GET THE INPUT NUMBER
040352  100004                         BPL     1$              ;;BR IF INPUT IS POS.
040354  005405                         NEG     R5              ;;MAKE THE BINARY NUMBER POS.
040356  112766  000055  000001         MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
040364  005000                  1$:    CLR     R0              ;;ZERO THE CONSTANTS INDEX
040366  012703  040544                 MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
040372  112723  000040                 MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
040376  005002                  2$:    CLR     R2              ;;CLEAR THE BCD NUMBER
040400  016001  040534                 MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
040404  160105                  3$:    SUB     R1,R5           ;;FORM THIS BCD DIGIT
040406  002402                         BLT     4$              ;;BR IF DONE
040410  005202                         INC     R2              ;;INCREASE THE BCD DIGIT BY 1
040412  000774                         BR      3$
040414  060105                  4$:    ADD     R1,R5           ;;ADD BACK THE CONSTANT
040416  005702                         TST     R2              ;;CHECK IF BCD DIGIT=0
040420  001002                         BNE     5$              ;;FALL THROUGH IF 0
040422  105716                         TSTB    (SP)            ;;STILL DOING LEADING 0'S?
040424  100407                         BMI     7$              ;;BR IF YES
040426  106316                  5$:    ASLB    (SP)            ;;MSD?
040430  103003                         BCC     6$              ;;BR IF NO
040432  116663  000001  177777         MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
040440  052702  000060          6$:    BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
040444  052702  000040          7$:    BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
040450  110223                         MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
040452  005720                         TST     (R0)+           ;;JUST INCREMENTING
040454  020027  000010                 CMP     R0,#10          ;;CHECK THE TABLE INDEX
040460  002746                         BLT     2$              ;;GO DO THE NEXT DIGIT
040462  003002                         BGT     8$              ;;GO TO EXIT
040464  010502                         MOV     R5,R2           ;;GET THE LSD
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040466  000764                          BR      6$              ;;GO CHANGE TO ASCII
040470  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
040472  100003                          BPL     9$              ;;BR IF NO
040474  116663  177777  177776        MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
040502  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
040504  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
040506  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
040510  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
040512  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
040514  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
040516  104401  040544                  TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
040522  016666  000002  000004          MOV     2(SP),4(SP)     ;;ADJUST THE STACK
040530  012616                          MOV     (SP)+,(SP)
040532  000002                          RTI                     ;;RETURN TO USER
040534  023420                  $DTBL:  10000.
040536  001750                          1000.
040540  000144                          100.
040542  000012                          10.
040544                          $DBLK:  .BLKW   4
   2944                         .SBTTL  SAVE AND RESTORE R0-R5 ROUTINES
                                ;;**************************************************************
                                ;*SAVE R0-R5
                                ;*CALL:
                                ;*      SAVREG
                                ;*UPON RETURN FROM $SAVREG THE STACK WILL LOOK LIKE:
                                ;*
                                ;*TOP---(+16)
                                ;* +2---(+18)
                                ;* +4---R5
                                ;* +6---R4
                                ;* +8---R3
                                ;*+10---R2
                                ;*+12---R1
                                ;*+14---R0
040554                          $SAVREG:
040554  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
040556  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
040560  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
040562  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
040564  010446                          MOV     R4,-(SP)        ;;PUSH R4 ON STACK
040566  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
040570  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF MAIN FLOW
040574  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF MAIN FLOW
040600  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PS OF CALL
040604  016646  000022                  MOV     22(SP),-(SP)    ;;SAVE PC OF CALL
040610  000002                          RTI
                                ;*RESTORE R0-R5
                                ;*CALL:
                                ;*      RESREG
040612                          $RESREG:
040612  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF CALL
040616  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF CALL
040622  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PC OF MAIN FLOW
040626  012666  000022                  MOV     (SP)+,22(SP)    ;;RESTORE PS OF MAIN FLOW
040632  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
040634  012604                          MOV     (SP)+,R4        ;;POP STACK INTO R4
040636  012603                          MOV     (SP)+,R3        ;;POP STACK INTO R3
```

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040640  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
040642  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
040644  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
040646  000002                          RTI
2945                            .SBTTL  DOUBLE LENGTH BINARY TO OCTAL ASCII CONVERT ROUTINE
                                ;;*****************************************************************
                                ;*THIS ROUTINE WILL CONVERT A 32-BIT UNSIGNED BINARY NUMBER TO AN
                                ;*UNSIGNED OCTAL ASCIZ NUMBER.
                                ;*CALL
                                ;*      MOV     #PNTR,-(SP)     ;;POINTER TO LOW WORD OF BINARY NUMBER
                                ;*      JSR     PC,@#$DB20      ;;CALL THE ROUTINE
                                ;*      RETURN                  ;;THE ADDRESS OF THE FIRST ASCIZ CHAR. IS ON THE STACK
040650  104413                  $DB20:  SAVREG                  ;;SAVE ALL REGISTERS
040652  016601  000002                  MOV     2(SP),R1        ;;PICKUP THE POINTER TO LOW WORD
040656  012705  040767                  MOV     #$OCTVL+13.,R5  ;;POINTER TO DATA TABLE
040662  012704  000014                  MOV     #12.,R4         ;;DO ELEVEN CHARACTERS
040666  012703  177770                  MOV     #^C7,R3         ;;MASK
040672  012100                          MOV     (R1)+,R0        ;;LOWER WORD
040674  012101                          MOV     (R1)+,R1        ;;HIGH WORD
040676  005002                          CLR     R2              ;;TERMINATOR
040700  110245                  1$:     MOVB    R2,-(R5)        ;;PUT CHARACTER IN DATA TABLE
040702  010002                          MOV     R0,R2           ;;GET THIS DIGIT
040704  005304                          DEC     R4              ;;COUNT THIS CHARACTER
040706  003007                          BGT     3$              ;;BR IF NOT THE LAST DIGIT
040710  001405                          BEQ     2$              ;;BR IF IT IS THE LAST DIGIT
040712  005205                          INC     R5              ;;ALL DIGITS DONE-ADJUST POINTER FOR FIRST
040714  010566  000002                  MOV     R5,2(SP)        ;;ASCIZ CHAR. & PUT IT ON THE STACK
040720  104414                          RESREG                  ;;RESTORE ALL REGISTERS
040722  000207                          RTS     PC              ;;RETURN TO USER
040724  006203                  2$:     ASR     R3              ;;POSITION THE MASK FOR THE LAST DIGIT
040726  006001                  3$:     ROR     R1              ;;POSITION THE BINARY NUMBER FOR
040730  006000                          ROR     R0              ;;      THE NEXT OCTAL DIGIT
040732  006001                          ROR     R1
040734  006000                          ROR     R0
040736  006001                          ROR     R1
040740  006000                          ROR     R0
040742  040302                          BIC     R3,R2           ;;MASK OUT ALL JUNK
040744  062702  000060                  ADD     #'0,R2          ;;MAKE THIS CHAR. ASCII
040750  000753                          BR      1$              ;;GO PUT IT IN THE DATA TABLE
040752                          $OCTVL: .BLKB   14.             ;;RESERVE DATA TABLE
```

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2947                                    .SBTTL  TRAP DECODER
                                        ;;**********************************************************************
                                        ;*THIS ROUTINE WILL PICKUP THE LOWER BYTE OF THE "TRAP" INSTRUCTION
                                        ;*AND USE IT TO INDEX THROUGH THE TRAP TABLE FOR THE STARTING ADDRESS
                                        ;*OF THE DESIRED ROUTINE. THEN USING THE ADDRESS OBTAINED IT WILL
                                        ;*GO TO THAT ROUTINE.
040770  010046                          $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
040772  016600  000002                          MOV     2(SP),R0        ;;GET TRAP ADDRESS
040776  005740                                  TST     -(R0)           ;;BACKUP BY 2
041000  111000                                  MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
041002  006300                                  ASL     R0              ;;POSITION FOR INDEXING
041004  016000  041024                          MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
041010  000200                                  RTS     R0              ;;GO TO ROUTINE
                                        ;;THIS IS USE TO HANDLE THE "GETPRI" MACRO
041012  011646                          $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
041014  016666  000004  000002                  MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
041022  000002                                  RTI                     ;;RESTORE THE PSW
                                        .SBTTL  TRAP TABLE
                                        ;*THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                        ;*BY THE "TRAP" INSTRUCTION.
                                        ;       ROUTINE
                                        ;       -------
041024  041012                          $TRPAD: .WORD   $TRAP2
041026  037226                                  $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
041030  040126                                  $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
041032  040102                                  $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
041034  040142                                  $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
041036  040330                                  $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
041040  040026                                  $TYPBN  ;;CALL=TYPBN    TRAP+6(104406)  TYPE BINARY (ASCII) NUMBER
041042  036202                                  $GTSWR  ;;CALL=GTSWR    TRAP+7(104407)  GET SOFT-SWR SETTING
041044  036132                                  $CKSWR  ;;CALL=CKSWR    TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR
041046  036454                                  $RDCHR  ;;CALL=RDCHR    TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE
041050  036574                                  $RDLIN  ;;CALL=RDLIN    TRAP+12(104412) TTY TYPEIN STRING ROUTINE
041052  040554                                  $SAVREG ;;CALL=SAVREG   TRAP+13(104413) SAVE R0-R5 ROUTINE
041054  040612                                  $RESREG ;;CALL=RESREG   TRAP+14(104414) RESTORE R0-R5 ROUTINE
2948                                    .SBTTL  POWER DOWN AND UP ROUTINES
                                        ;;**********************************************************************
                                        ;POWER DOWN ROUTINE
041056  012737  041234  000024          $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
041064  012737  000340  000026                  MOV     #340,@#PWRVEC+2 ;;PRIO:7
041072  010046                                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
041074  010146                                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
041076  010246                                  MOV     R2,-(SP)        ;;PUSH R2 ON STACK
041100  010346                                  MOV     R3,-(SP)        ;;PUSH R3 ON STACK
041102  010446                                  MOV     R4,-(SP)        ;;PUSH R4 ON STACK
041104  010546                                  MOV     R5,-(SP)        ;;PUSH R5 ON STACK
041106  017746  140026                          MOV     @SWR,-(SP)      ;;PUSH @SWR ON STACK
041112  010667  000122                          MOV     SP,$SAVR6       ;;SAVE SP
041116  012737  041130  000024                  MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
041124  000000                                  HALT
041126  000776                                  BR      .-2             ;;HANG UP
                                        ;;**********************************************************************
                                        ;POWER UP ROUTINE
041130  012737  041234  000024          $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
041136  016706  000076                          MOV     $SAVR6,SP       ;;GET SP
041142  005067  000072                          CLR     $SAVR6          ;;WAIT LOOP FOR THE TTY
041146  005267  000066                  1$:     INC     $SAVR6          ;;WAIT FOR THE INC
```

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041152  001375                          BNE     1$                      ;;OF  WORD
041154  012677  137760                  MOV     (SP)+,@SWR              ;;POP STACK INTO @SWR
041160  012605                          MOV     (SP)+,R5                ;;POP STACK INTO R5
041162  012604                          MOV     (SP)+,R4                ;;POP STACK INTO R4
041164  012603                          MOV     (SP)+,R3                ;;POP STACK INTO R3
041166  012602                          MOV     (SP)+,R2                ;;POP STACK INTO R2
041170  012601                          MOV     (SP)+,R1                ;;POP STACK INTO R1
041172  012600                          MOV     (SP)+,R0                ;;POP STACK INTO R0
041174  012737  041056  000024          MOV     #$PWRDN,@#PWRVEC        ;;SET UP THE POWER DOWN VECTOR
041202  012737  000340  000026          MOV     #340,@#PWRVEC+2         ;;PRIO:7
041210  104401                          TYPE                            ;;REPORT THE POWER FAILURE
041212  041242                  $PWRMG: .WORD   PWRMSG                  ;;POWER FAIL MESSAGE POINTER
041214  012716                          MOV     (PC)+,(SP)              ;;RESTART AT START
041216  020000                  $PWRAD: .WORD   START                   ;;RESTART ADDRESS
041220  042766  000020  000002          BIC     #20,2(SP)               ;;CLEAR 'T' BIT
041226  005067  140114                  CLR     $TBIT                   ;;CLEAR THE 'T' BIT FLAG
041232  000002                          RTI
041234  000000                  $ILLUP: HALT                            ;;THE POWER UP SEQUENCE WAS STARTED
041236  000776                          BR      .-2                     ;; BEFORE THE POWER DOWN WAS COMPLETE
041240  000000                  $SAVR6: 0                               ;;PUT THE SP HERE
2949 041242     012     015     040    PWRMSG: .ASCIZ  <12><15>? POWER FAILURE - RESTARTING ?<12><15>
     041245     120     117     127
     041250     105     122     040
     041253     106     101     111
     041256     114     125     122
     041261     105     040     055
     041264     040     122     105
     041267     123     124     101
     041272     122     124     111
     041275     116     107     040
     041300     012     015     000
2950                                    .EVEN
2951
2952
```

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                                        .SBTTL  ERROR MESSAGES, DATA HEADERS-TABLES & FORMATS
                                        .NLIST  BEX
041304  125  116  105  EM1:    .ASCIZ  /UNEXPECTED CPU TRAP TO LOC. 004/
041344  125  116  105  EM2:    .ASCIZ  /UNEXPECTED MEM. MGMT. TRAP TO LOC. 250/
041413  120  122  111  EM3:    .ASCIZ  /PRIORITY BITS SET WRONG IN PSW/
041452  115  117  104  EM4:    .ASCIZ  /MODE BITS SET WRONG IN PSW/
041505  104  125  101  EM5:    .ASCIZ  /DUAL ADDRESSING BETWEEN HI&LO BYTES OF PSW/
041560  113  105  122  EM6:    .ASCIZ  /KERNEL R6 CHANGED BY WRITING SUPERVISOR OR USER R6/
041643  101  040  115  EM7:    .ASCIZ  /A MEMORY MGMT. REG. TIMED OUT/
041701  123  125  115  EM10:   .ASCIZ  /SUMMARY OF MEM. MGMT. REG. TIMEOUTS/
041745  115  105  115  EM11:   .ASCIZ  /MEM. MGMT. REG. WOULD NOT CLEAR/
042005  115  105  115  EM12:   .ASCIZ  /MEM. MGMT. REG. BITS NOT SET CORRECTLY/
042054  123  122  060  EM13:   .ASCIZ  /SR0 EFFECTED BY WRITE TO PSW/
042111  115  115  122  EM14:   .ASCIZ  /MMR1 DID NOT TRACK PROPERLY/
042145  115  115  122  EM15:   .ASCIZ  /MMR3 IS HOLDING THE WRONG DATA/
042204  104  125  101  EM16:   .ASCIZ  /DUAL ADDRESSING BETWEEN PAR-PDR GROUPS/
042253  102  101  104  EM17:   .ASCIZ  /BAD RELOCATION,ON STORING DATA 18-BIT MAPPING/
042331  120  110  131  EM20:   .ASCIZ  /PHYS. ADDR. FORMED WRONG IN RELOCATE MODE/
042403  123  122  062  EM21:   .ASCIZ  /SR2 NOT TRACKING CORRECTLY/
042436  127  122  117  EM22:   .ASCIZ  /WRONG PDR'S REFERENCED WHILE IN RELOCATE MODE/
042514  120  101  122  EM23:   .ASCIZ  /PAR OR PDR CHANGED BY A RESET/
042552  115  101  111  EM24:   .ASCIZ  /MAINT. MODE (SR0 <8>) NOT DISABLED BY A RESET/
042630  104  101  124  EM25:   .ASCIZ  /DATA INCORRECT AFTER A MAINT. MODE WRITE/
042701  123  117  125  EM26:   .ASCIZ  /SOURCE RELOCATED IN MAINT. MODE/
042741  123  122  062  EM27:   .ASCIZ  /SR2 DID NOT LOCK UP CORRECT VIRTUAL ADDRESS/
043015  106  117  114  EM30:   .ASCIZ  /FOLLOWING PAR-PDR WILL NOT ZERO/
043055  123  125  115  EM31:   .ASCIZ  /SUMMARY OF DUAL ADDRESSING ERRORS/
043117  123  125  115  EM32:   .ASCIZ  /SUMMARY OF COUNT PATTERN FAILURES/
043161  105  122  122  EM33:   .ASCIZ  /ERROR IN BYTE ADDRESSING OF PAR-PDR/
043225  124  110  105  EM34:   .ASCIZ  /THE FOLLOWING ARE DUAL ADDRESSING ERRORS FOR PAR'S-PDR'S/
043316  124  110  105  EM36:   .ASCIZ  /THE FOLLOWING ARE COUNT PATTERN ERRORS FOR PAR'S-PDR'S/
043405  111  114  114  EM40:   .ASCIZ  /ILLEGAL (MODE 10) STACK POINTER NOT MAPPED TO USER/
043470  061  070  055  EM41:   .ASCIZ  /18-BIT MAPPING POSSIBLE HOLE IN MAIN MEMORY FROM/
043551  106  101  125  EM42:   .ASCIZ  /FAULTY CARRY PROPAGATION 18-BIT MAPPING/
043621  061  070  055  EM43:   .ASCIZ  /18-BIT MAPPING POSSIBLE HOLE AT TOP OF MEMORY/
043677  116  117  040  EM44:   .ASCIZ  /NO TRAP THRU ERRVEC,AT 18-BIT ADDR. 760000/
043752  104  111  104  EM45:   .ASCIZ  /DIDN'T GET WRAP AROUND TO ADDRESS ZERO/
044021  116  117  040  EM46:   .ASCIZ  /NO TRAP THRU ERRVEC, ON NON-EXISTANT ADDR./
044074  120  122  105  EM47:   .ASCIZ  /PREMATURE END OF MEMORY FOUND/
044132  062  062  055  EM50:   .ASCIZ  /22-BIT MAPPING POSSIBLE HOLE IN MAIN MEMORY FROM/
044213  102  101  104  EM51:   .ASCIZ  /BAD RELOCATION,CARRY PROPAGATION 22-BIT MAPPING/
044273  062  062  055  EM52:   .ASCIZ  /22-BIT MAPPING POSSIBLE HOLE AT TOP OF MEMORY/
044351  104  111  104  EM53:   .ASCIZ  /DID NOT GET UNIBUS ADDRESS/
044404  127  055  102  EM54:   .ASCIZ  /W-BIT DID NOT GET SET IN PDR/
044441  127  055  102  EM55:   .ASCIZ  /W-BIT SET IN MORE THAN ONE PDR/
044500  127  055  102  EM56:   .ASCIZ  /W-BIT NOT CLEARED BY WRITING TO PDR/
044544  127  055  102  EM57:   .ASCIZ  /W-BIT GOT SET DURING ODD ADDR. ABORT/
044611  116  117  040  EM60:   .ASCIZ  /NO APT SPECIAL HARDWARE FOUND/

044647  117  114  104  DH1:    .ASCIZ  /OLD PC  OLD PSW R6 WAS  CPUERR  TESTNO  ERRORPC/
044727  117  114  104  DH2:    .ASCIZ  /OLD PC  OLD PSW R6 WAS  SR0     SR1    SR2     TESTNO  ERRORPC/
045026  127  122  117  DH3:    .ASCIZ  /WROTE   READ    TESTNO  ERRORPC/
045066  101  104  104  DH7:    .ASCIZ  /ADDRESS TESTNO  ERRORPC/
045116  122  105  107  DH10:   .ASCII  /REGISTER-ADDRS  NUM  OF/<CRLF>
045146  101  116  104          .ASCIZ  /AND-ED  OR-ED   TIMOUTS TESTNO  ERRORPC/
045216  122  105  107  DH11:   .ASCII  /REGISTR READ    READ-(BINARY)/<CRLF>
045254  101  104  104          .ASCIZ  /ADDRESS (OCTAL) 5432109876543210  TESTNO  ERRORPC/
```

```
3011 045336  122  105  107  DH12:  .ASCII  /REGISTR WROTE   READ    READ-(BINARY)/<CRLF>
3012 045404  101  104  104         .ASCIZ  /ADDRESS (OCTAL) (OCTAL) 543210987654321  TESTNO  ERRORPC/
3013 045476  122  105  101  DH13:  .ASCIZ  /READ    TESTNO  ERRORPC/
3014 045526  105  130  120  DH14:  .ASCIZ  /EXPECTD (MMR1)  TESTNO  ERRORPC/
3015 045566  114  117  101  DH15:  .ASCIZ  /LOADED  (MMR3)  TESTNO  ERRORPC/
3016 045626  111  116  104  DH16:  .ASCII  /INDEX   INDEX   PAR-PDR/<CRLF>
3017 045656  105  130  120         .ASCIZ  /EXPECTD RECEIVD ADDRREAD TESTNO  ERRORPC/
3018 045727  126  111  122  DH17:  .ASCIZ  /VIR ADDR KIPAR4  GDDATA  BADDATA TESTNO  ERRORPC/
3019 046010  120  110  131  DH20:  .ASCII  /PHYSICL PAR 4   PAR 5/<CRLF>
3020 046036  101  104  104         .ASCIZ  /ADDRESS VBA     VBA     PAR 4   PAR 5   PSW     TESTNO  ERRORPC/
3021 046136  123  122  062  DH21:  .ASCIZ  /SR2 WAS EXPECTD TESTNO  ERRORPC/
3022 046176  120  110  131  DH22:  .ASCII  /PHYSICL PAR 4/<CRLF>
3023 046214  101  104  104         .ASCIZ  /ADDRESS V.B.A.  PAR 4   SR0 WAS SR2 WAS PSW     TESTNO  ERRORPC/
3024 046314  124  105  123  DH24:  .ASCIZ  /TESTNO  ERRORPC/
3025 046334  101  104  104  DH30:  .ASCIZ  /ADDRESS DATA    TESTNO  ERRORPC/
3026 046374  101  104  104  DH31:  .ASCII  /ADDROR  ADDRAND ADDROR  ADDRAND/<CRLF>
3027 046434  114  117  101         .ASCIZ  /LOADED  LOADED ENABLED ENABLED TESTNO  #ERRORS/
3028 046513  101  104  104  DH32:  .ASCIZ  /ADDROR  ADDRAND PATRNOR PATRNAD DATAOR  DATAAND TESTNO  #ERRORS/
3029 046613  101  104  104  DH33:  .ASCIZ  /ADDRESS EXPECTD RECEIVD TESTNO  ERRORPC/
3030 046663  101  104  104  DH34:  .ASCIZ  /ADDRESS ADDRESS/
3031 046703  101  104  104  DH36:  .ASCIZ  /ADDRESS DATARED PATTERN COUNT   TESTNO/
3032 046752  122  105  101  DH40:  .ASCII  /READOFF TESTNO  ERRORPC/<CRLF>
3033 047002  123  124  101         .ASCIZ  /STACK/
3034 047010  123  124  101  DH41:  .ASCIZ  /STARTBK FINISHBK TESTNO  ERRORPC/
3035 047051  120  101  124  DH42:  .ASCII  /PATTERN DATA    ADDRESS/<CRLF>
3036 047101  114  117  101         .ASCIZ  /LOADED  FETCHED INTENDED  TESTNO  ERRORPC/
3037 047153  123  124  101  DH43:  .ASCIZ  /STARTBK TESTNO  ERRORPC/
3038 047203  104  101  124  DH45:  .ASCIZ  /DATA    TESTNO  ERRORPC/
3039 047233  116  105  101  DH46:  .ASCIZ  /NEADDR TESTNO  ERRORPC/
3040 047262  113  111  120  DH47:  .ASCIZ  /KIPAR4    LASTBLOCK TESTNO  ERRORPC/
3041 047326  120  104  122  DH54:  .ASCII  /PDR     VIRTUAL/<CRLF>
3042 047346  124  105  123         .ASCIZ  /TESTED  ADDRESS TESTNO  ERRORPC/
3043 047406  120  104  122  DH55:  .ASCII  /PDR IN  PDR     VIRTUAL/<CRLF>
3044 047436  105  122  122         .ASCIZ  /ERROR   TESTED  ADDRESS TESTNO  ERRORPC/
3045 047506  120  104  122  DH56:  .ASCIZ  /PDR     TESTNO  ERRORPC/
3046 047536  120  104  122  DH57:  .ASCIZ  /PDR WAS EXPECTD TESTNO  ERRORPC/
3047 047576  105  122  122  DH60:  .ASCIZ  /ERRORPC/
3048                              .EVEN
3049
3050 047606  001260  001262  001256  DT1:   .WORD   TRAPPC,TRAPPS,WASR6,CPUERR,TESTNO,$ERRPC,0
3051 047624  001260  001262  001256  DT2:   .WORD   TRAPPC,TRAPPS,WASR6,WASSR0,WASSR1,WASSR2,TESTNO,$ERRPC,0
3052 047646  001162  001164  001254  DT3:   .WORD   $REG0,$REG1,TESTNO,$ERRPC,0
3053 047660  001162  001254  001116  DT7:   .WORD   $REG0,TESTNO,$ERRPC,0
3054 047670  001320  001316  001274  DT10:  .WORD   ADRAND,ADDROR,TONUM,TESTNO,$ERRPC,0
3055 047704  001162  001164  001164  DT11:  .WORD   $REG0,$REG1,$REG1,TESTNO,$ERRPC,0
3056 047720  001162  001164  001166  DT12:  .WORD   $REG0,$REG1,$REG2,$REG2,TESTNO,$ERRPC,0
3057 047736  001170  001164  001254  DT14:  .WORD   $REG3,$REG1,TESTNO,$ERRPC,0
3058 047750  001166  001164  001254  DT15:  .WORD   $REG2,$REG1,TESTNO,$ERRPC,0
3059 047762  001162  001164  001166  DT16:  .WORD   $REG0,$REG1,$REG2,TESTNO,$ERRPC,0
3060 047776  001162  172350  001164  DT17:  .WORD   $REG0,KIPAR4,$REG1,$REG2,TESTNO,$ERRPC,0
3061 050014  001302  001276  001300  DT20:  .WORD   PBALO,VIRT1,VIRT2,$REG4,$REG5,$TMP0,TESTNO,$ERRPC,0
3062 050036  001270  001164  001254  DT21:  .WORD   WASSR2,$REG1,TESTNO,$ERRPC,0
3063 050050  001302  001276  001172  DT22:  .WORD   PBALO,VIRT1,$REG4,WASSR0,WASSR2,$TMP0,TESTNO,$ERRPC,0
3064 050072  001254  001116  000000  DT24:  .WORD   TESTNO,$ERRPC,0
3065 050100  001164  001166  001254  DT25:  .WORD   $REG1,$REG2,TESTNO,$ERRPC,0
3066 050112  001270  001172  001254  DT27:  .WORD   WASSR2,$REG4,TESTNO,$ERRPC,0
3067 050124  001162  001166  001254  DT30:  .WORD   $REG0,$REG2,TESTNO,ERRCNT,0
```

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3068 050136  001316  001320  001306  DT31:   .WORD   ADDROR,ADRAND,DATAOR,DATAND,TESTNO,ERRCNT,0
3069 050154  001316  001320  001312  DT32:   .WORD   ADDROR,ADRAND,PATTOR,PATAND,DATAOR,DATAND,TESTNO,ERRCNT,0
3070 050176  001162  001166  001164  DT33:   .WORD   $REG0,$REG2,$REG1,TESTNO,$ERRPC,0
3071 050212  001162  001164  001254  DT35:   .WORD   $REG0,$REG1,TESTNO,0
3072 050222  001162  001166  001172  DT37:   .WORD   $REG0,$REG2,$REG4,$REG1,TESTNO,0
3073 050236  001200  001202  001254  DT41:   .WORD   $TMP1,$TMP2,TESTNO,$ERRPC,0
3074 050250  001166  001170  001162  DT42:   .WORD   $REG2,$REG3,$REG0,TESTNO,$ERRPC,0
3075 050264  001200  001254  001116  DT43:   .WORD   $TMP1,TESTNO,$ERRPC,0
3076 050274  001164  001254  001116  DT45:   .WORD   $REG1,TESTNO,$ERRPC,0
3077 050304  172350  003022  001254  DT47:   .WORD   KIPAR4,$LSTBK,TESTNO,$ERRPC,0
3078 050316  001174  001170  001254  DT54:   .WORD   $REG5,$REG3,TESTNO,$ERRPC,0
3079 050330  001162  001174  001170  DT55:   .WORD   $REG0,$REG5,$REG3,TESTNO,$ERRPC,0
3080 050344  001174  001254  001116  DT56:   .WORD   $REG5,TESTNO,$ERRPC,0
3081 050354  001116  000000          DT60:   .WORD   $ERRPC,0
3082
3083 050360     000     000     000  DF1:    .BYTE   0,0,0,0,0
3084 050365     000     000     000  DF2:    .BYTE   0,0,0,0,0,0,0,0
3085 050375     000     000     000  DF3:    .BYTE   0,0,0,0
3086 050401     000     000     000  DF7:    .BYTE   0,0,0
3087 050404     000     000     001  DF10:   .BYTE   0,0,1,0,0
3088 050411     000     000     002  DF11:   .BYTE   0,0,2,0,0
3089 050416     000     000     000  DF12:   .BYTE   0,0,0,2,0,0
3090 050424     000     000     000  DF16:   .BYTE   0,0,0,0,0,0
3091 050432     003     000     000  DF20:   .BYTE   3,0,0,0,0,0,0,0
3092 050442     000     000          DF24:   .BYTE   0,0
3093 050444     000     000     000  DF32:   .BYTE   0,0,0,0,0,1
3094 050452     000     000     000  DF33:   .BYTE   0,0,0,0,0,0,0,1
3095 050462     004     000     000  DF43:   .BYTE   4,0,0
3096                                 .LIST   BEX
3097                                 .EVEN
3098
3099          000001                 .END
```

```
ABASE = 000000
ACDW1 = 000000
ACDW2 = 000000
ACPUOP= 000000
ADDROR  001316
ADDW0 = 000000
ADDW1 = 000000
ADDW10= 000000
ADDW11= 000000
ADDW12= 000000
ADDW13= 000000
ADDW14= 000000
ADDW15= 000000
ADDW2 = 000000
ADDW3 = 000000
ADDW4 = 000000
ADDW5 = 000000
ADDW6 = 000000
ADDW7 = 000000
ADDW8 = 000000
ADDW9 = 000000
ADEVCT= 000000
ADEVM = 000000
ADRAND  001320
AENV  = 000000
AENVM = 000000
AFATAL= 000000
AMADR1= 000000
AMADR2= 000000
AMADR3= 000000
AMADR4= 000000
AMAMS1= 000000
AMAMS2= 000000
AMAMS3= 000000
AMAMS4= 000000
AMSGAD= 000000
AMSGLG= 000000
AMSGTY= 000000
AMTYP1= 000000
AMTYP2= 000000
AMTYP3= 000000
AMTYP4= 000000
APASS = 000000
APRIOR= 000000
APTCSU= 000040
APTENV= 000001
APTSIZ= 000200
APTSPO= 000100
APTTST  031372
ASWREG= 000000
ATESTN= 000000
AUNIT = 000000
AUSWR = 000000
AVECT1= 000000
AVECT2= 000000
BADPC   001324
BIT0  = 000001
BIT00 = 000001
BIT01 = 000002
BIT02 = 000004
BIT03 = 000010
BIT04 = 000020
BIT05 = 000040
BIT06 = 000100
BIT07 = 000200
BIT08 = 000400
BIT09 = 001000
BIT1  = 000002
BIT10 = 002000
BIT11 = 004000
BIT12 = 010000
BIT13 = 020000
BIT14 = 040000
BIT15 = 100000
BIT2  = 000004
BIT3  = 000010
BIT4  = 000020
BIT5  = 000040
BIT6  = 000100
BIT7  = 000200
BIT8  = 000400
BIT9  = 001000
BPTVEC= 000014
CKSWR = 104410
CLEANU  002276
CLRREG  002260
CMSG    037175
CNTRLC  037116
CPUERR= 177766
CPUEXP  001334
CR    = 000015
CRLF  = 000200
DATAND  001310
DATAOR  001306
DDISP = 177570
DF1     050360
DF10    050404
DF11    050411
DF12    050416
DF16    050424
DF2     050365
DF20    050432
DF24    050442
DF3     050375
DF32    050444
DF33    050452
DF43    050462
DF7     050401
DH1     044647
DH10    045116
DH11    045216
DH12    045336
DH13    045476
DH14    045526
DH15    045566
DH16    045626
DH17    045727
DH2     044727
DH20    046010
DH21    046136
DH22    046176
DH24    046314
DH3     045026
DH30    046334
DH31    046374
DH32    046513
DH33    046613
DH34    046663
DH36    046703
DH40    046752
DH41    047010
DH42    047051
DH43    047153
DH45    047203
DH46    047233
DH47    047262
DH54    047326
DH55    047406
DH56    047506
DH57    047536
DH60    047576
DH7     045066
DISPLA  001142
DISPRE  000174
DSWR  = 177570
DT1     047606
DT10    047670
DT11    047704
DT12    047720
DT14    047736
DT15    047750
DT16    047762
DT17    047776
DT2     047624
DT20    050014
DT21    050036
DT22    050050
DT24    050072
DT25    050100
DT27    050112
DT3     047646
DT30    050124
DT31    050136
DT32    050154
DT33    050176
DT35    050212
DT37    050222
DT41    050236
DT42    050250
DT43    050264
DT45    050274
DT47    050304
DT54    050316
DT55    050330
DT56    050344
DT60    050354
DT7     047660
DUALAD  002334
EMTVEC= 000030
EM1     041304
EM10    041701
EM11    041745
EM12    042005
EM13    042054
EM14    042111
EM15    042145
EM16    042204
EM17    042253
EM2     041344
EM20    042331
EM21    042403
EM22    042436
EM23    042514
EM24    042552
EM25    042630
EM26    042701
EM27    042741
EM3     041413
EM30    043015
EM31    043055
EM32    043117
EM33    043161
EM34    043225
EM36    043316
EM4     041452
EM40    043405
EM41    043470
EM42    043551
EM43    043621
EM44    043677
EM45    043752
EM46    044021
EM47    044074
EM5     041505
EM50    044132
EM51    044213
EM52    044273
EM53    044351
EM54    044404
EM55    044441
EM56    044500
EM57    044544
EM6     041560
EM60    044611
EM7     041643
ERRCNT  001322
ERROR = 104000
ERRTYP  035624
ERRVEC= 000004
FORMPA  003220
GTSWR = 104407
HDWFLA  001340
HOLFLG  001336
HT    = 000011
IOTVEC= 000020
KDPAR0= 172360
KDPAR1= 172362
KDPAR2= 172364
KDPAR3= 172366
KDPAR4= 172370
KDPAR5= 172372
KDPAR6= 172374
KDPAR7= 172376
KDPDR0= 172320
KDPDR1= 172322
KDPDR2= 172324
KDPDR3= 172326
KDPDR4= 172330
KDPDR5= 172332
KDPDR6= 172334
KDPDR7= 172336
KERSTK= 001100
KIPAR0= 172340
KIPAR1= 172342
KIPAR2= 172344
KIPAR3= 172346
KIPAR4= 172350
KIPAR5= 172352
KIPAR6= 172354
KIPAR7= 172356
KIPDR0= 172300
KIPDR1= 172302
KIPDR2= 172304
KIPDR3= 172306
KIPDR4= 172310
KIPDR5= 172312
KIPDR6= 172314
KIPDR7= 172316
KSP   =%000006
LF    = 000012
LOOP    020456
MGMERR  003122
MGMFLG  003124
MMR0  = 177572
MMR1  = 177574
MMR2  = 177576
MMR3  = 172516
MMVEC = 000250
OLDPC   001326
OLDPS   001330
PARCOU  002400
PARTAB  001356
PATAND  001314
PATTOR  001312
PBAHI   001304
```

```
PBALO   001302
PCPUER  001332
PIRQ  = 177772
PIRQVE= 000240
PR0   = 000000
PR1   = 000040
PR2   = 000100
PR3   = 000140
PR4   = 000200
PR5   = 000240
PR6   = 000300
PR7   = 000340
PS    = 177776
PSW   = 177776
PWRMSG  041242
PWRVEC= 000024
RDCHR = 104411
RDLIN = 104412
READON  001342
RESREG= 104414
RESVEC= 000010
RMIREG= 177770
R6    =%000006
R7    =%000007
SAVREG= 104413
SCOPE = 000004
SDPAR0= 172260
SDPAR1= 172262
SDPAR2= 172264
SDPAR3= 172266
SDPAR4= 172270
SDPAR5= 172272
SDPAR6= 172274
SDPAR7= 172276
SDPDR0= 172220
SDPDR1= 172222
SDPDR2= 172224
SDPDR3= 172226
SDPDR4= 172230
SDPDR5= 172232
SDPDR6= 172234
SDPDR7= 172236
SIPAR0= 172240
SIPAR1= 172242
SIPAR2= 172244
SIPAR3= 172246
SIPAR4= 172250
SIPAR5= 172252
SIPAR6= 172254
SIPAR7= 172256
SIPDR0= 172200
SIPDR1= 172202
SIPDR2= 172204
SIPDR3= 172206
SIPDR4= 172210
SIPDR5= 172212
SIPDR6= 172214
SIPDR7= 172216
SR0   = 177572
SR1   = 177574
SR2   = 177576
SR3   = 172516
SSP   =%000006
STACK = 001100
START   020000
STKLMT= 177774
SUPSTK= 000700
SWR     001140
SWREG   000176
SW0   = 000001
SW00  = 000001
SW01  = 000002
SW02  = 000004
SW03  = 000010
SW04  = 000020
SW05  = 000040
SW06  = 000100
SW07  = 000200
SW08  = 000400
SW09  = 001000
SW1   = 000002
SW10  = 002000
SW11  = 004000
SW12  = 010000
SW13  = 020000
SW14  = 040000
SW15  = 100000
SW2   = 000004
SW3   = 000010
SW4   = 000020
SW5   = 000040
SW6   = 000100
SW7   = 000200
SW8   = 000400
SW9   = 001000
TBIT  = 000020
TBITPS  001272
TBITVE= 000014
TESTNO  001254
TIMERR  003024
TIMFLG  003026
TKVEC = 000060
TOFF    002172
TON     002226
TONUM   001274
TPVEC = 000064
TRAPPC  001260
TRAPPS  001262
TRAPVE= 000034
TRTVEC= 000014
TST1    020566
TST10   021650
TST11   022002
TST12   022134
TST13   022266
TST14   022420
TST15   022562
TST16   022622
TST17   023226
TST2    020644
TST20   023350
TST21   023546
TST22   023744
TST23   024142
TST24   024340
TST25   024536
TST26   024734
TST27   025046
TST3    020730
TST30   025160
TST31   025272
TST32   025410
TST33   025526
TST34   025644
TST35   025750
TST36   026054
TST37   026160
TST4    021052
TST40   026264
TST41   026370
TST42   026474
TST43   026570
TST44   027116
TST45   027252
TST46   027510
TST47   031452
TST5    021212
TST50   032312
TST51   033174
TST52   034010
TST53   034204
TST54   034412
TST55   034620
TST6    021364
TST7    021516
TYPBN = 104406
TYPDS = 104405
TYPE  = 104401
TYPOC = 104402
TYPON = 104404
TYPOS = 104403
UDPAR0= 177660
UDPAR1= 177662
UDPAR2= 177664
UDPAR3= 177666
UDPAR4= 177670
UDPAR5= 177672
UDPAR6= 177674
UDPAR7= 177676
UDPDR0= 177620
UDPDR1= 177622
UDPDR2= 177624
UDPDR3= 177626
UDPDR4= 177630
UDPDR5= 177632
UDPDR6= 177634
UDPDR7= 177636
UIPAR0= 177640
UIPAR1= 177642
UIPAR2= 177644
UIPAR3= 177646
UIPAR4= 177650
UIPAR5= 177652
UIPAR6= 177654
UIPAR7= 177656
UIPDR0= 177600
UIPDR1= 177602
UIPDR2= 177604
UIPDR3= 177606
UIPDR4= 177610
UIPDR5= 177612
UIPDR6= 177614
UIPDR7= 177616
USESTK= 000600
USP   =%000006
VIRT1   001276
VIRT2   001300
WASR6   001256
WASSR0  001264
WASSR1  001266
WASSR2  001270
WBIT  = 000100
$APTHD  000204
$ATYC   037604
$ATY1   037560
$ATY3   037566
$ATY4   037576
$AUTOB  001134
$BDADR  001122
$BDDAT  001126
$BELL   001214
$BIN    040100
$CHARC  037554
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$CM3  = 000006
$CM4  = 000006
$CNTLC  001350
$CNTLG  037067
$CNTLU  037062
$CORE   002676
$CPUOP  001252
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$CROUT  002726
$DBLK   040544
$DB20   040650
$DEVCT  001234
$DOAGN  035126
$DTBL   040534
$ENDAD  035116
$ENDCT  034744
$ENULL  035170
$ENV    001244
$ENVM   001245
$EOP    034714
$EOPCT  034736
$ERFLG  001103
$ERMAX  001115
$ERROR  035366
$ERRPC  001116
$ERRTB  001372
$ERTTL  001112
$ESCAP  001212
$ETABL  001244
$ETEND  001254
$FATAL  001226
$FFLG   040024
$FILLC  001156
$FILLS  001155
$GDADR  001120
$GDDAT  001124
$GET42  035070
$GTSWR  036202
$HD   = 000000
$HIBTS  000204
$ICNT   001104
$ILLUP  041234
$INTAG  001135
$ITEMB  001114
$KTNEX  002670
$KTOUT  002660
$KT11   002512
$LF     001222
$LFLG   040023
$LOOP   035164
$LPADR  001106
$LPERR  001110
$LSTAD  003020
$LSTBK  003022
$MAIL   001224
$MBADR  000206
$MFLG   040022
$MNEW   037105
$MSGAD  001240
$MSGLG  001242
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$MSWR   037074
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$NULL   001154
$NWTST= 000001
$OCNT   040324
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$OVER   035352          $REG2   001166          $SVLAD  035316          $TMP5   001210          $TYPE   037226
$PASS   001232          $REG3   001170          $SVPC = 000204          $TN   = 000056          $TYPEC  037440
$PASTM  000212          $REG4   001172          $SWR  = 173400          $TPB    001152          $TYPEX  037556
$PWRAD  041216          $REG5   001174          $SWREG  001246          $TPFLG  001157          $TYPOC  040126
$PWRDN  041056          $RESRE  040612          $SWRMK= 000000          $TPS    001150          $TYPON  040142
$PWRMG  041212          $RTNAD  035166          $TBIT   001346          $TRAP   040770          $TYPOS  040102
$PWRUP  041130          $RTRN   035162          $TESTN  001230          $TRAP2  041012          $UNIT   001236
$QUES   001220          $SAVRE  040554          $TKB    001146          $TRP  = 000015          $UNITM  000214
$RDCHR  036454          $SAVR6  041240          $TKS    001144          $TRPAD  041024          $USWR   001250
$RDLIN  036574          $SCOPE  035174          $TMP0   001176          $TSTM   000210          $XTSTR  035206
$RDSZ = 000010          $SETUP= 000137          $TMP1   001200          $TSTNM  001102          $$GET4= 000001
$REGAD  001160          $SIZE   002454          $TMP2   001202          $TTYIN  037052          $OFILL  040325
$REG0   001162          $SIZEX  002732          $TMP3   001204          $TYPBN  040026          .$X   = 000204

. ABS.  050466      000
        000000      001
ERRORS DETECTED:  0

VIRTUAL MEMORY USED:  59296 WORDS  ( 232 PAGES)
DYNAMIC MEMORY:  20434 WORDS  ( 78 PAGES)
ELAPSED TIME:  00:07:09
CKKTAA0.BIN,CKKTAA0.SEQ/CRF=CKKTAA0.MLB/ML,CKKTAA0.P11
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CKKTAA0  CREATED BY MACRO ON 25-SEP-79 AT 12:31  PAGE 1
SYMBOL CROSS REFERENCE  CREF  SEQ 0110

| SYMBOL | VALUE | REFERENCES | | | | | | | | |
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| ACDW1 | = 000000 | 10-884 | | | | | | | | |
| ACDW2 | = 000000 | 10-884 | | | | | | | | |
| ACPUOP | = 000000 | 10-884 | 10-884 | | | | | | | |
| ADDROR | 001316 | #10-884 | *12-1255 | *12-1274 | *12-1297 | *18-1609 | *18-1630 | *18-1642 | *18-1642 | *18-1648 |
| | | *18-1648 | *18-1654 | *18-1654 | *18-1660 | *18-1660 | *18-1666 | *18-1666 | *18-1672 | *18-1672 |
| | | 36-3054 | 36-3068 | 36-3069 | | | | | | |
| ADDW0 | = 000000 | 10-884 | | | | | | | | |
| ADDW1 | = 000000 | 10-884 | | | | | | | | |
| ADDW10 | = 000000 | 10-884 | | | | | | | | |
| ADDW11 | = 000000 | 10-884 | | | | | | | | |
| ADDW12 | = 000000 | 10-884 | | | | | | | | |
| ADDW13 | = 000000 | 10-884 | | | | | | | | |
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| ADDW15 | = 000000 | 10-884 | | | | | | | | |
| ADDW2 | = 000000 | 10-884 | | | | | | | | |
| ADDW3 | = 000000 | 10-884 | | | | | | | | |
| ADDW4 | = 000000 | 10-884 | | | | | | | | |
| ADDW5 | = 000000 | 10-884 | | | | | | | | |
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| ADDW7 | = 000000 | 10-884 | | | | | | | | |
| ADDW8 | = 000000 | 10-884 | | | | | | | | |
| ADDW9 | = 000000 | 10-884 | | | | | | | | |
| ADEVCT | = 000000 | 10-884 | 10-884 | | | | | | | |
| ADEVM | = 000000 | 10-884 | | | | | | | | |
| ADRAND | 001320 | #10-884 | *12-1259 | 12-1275 | 12-1298 | *18-1608 | *18-1632 | *18-1642 | *18-1642 | *18-1648 |
| | | *18-1648 | *18-1654 | *18-1654 | *18-1660 | *18-1660 | *18-1666 | *18-1666 | *18-1672 | *18-1672 |
| | | 36-3054 | 36-3068 | 36-3069 | | | | | | |
| AENV | = 000000 | 10-884 | 10-884 | | | | | | | |
| AENVM | = 000000 | 10-884 | 10-884 | | | | | | | |
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| AMADR2 | = 000000 | 10-884 | | | | | | | | |
| AMADR3 | = 000000 | 10-884 | | | | | | | | |
| AMADR4 | = 000000 | 10-884 | | | | | | | | |
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| AMAMS2 | = 000000 | 10-884 | | | | | | | | |
| AMAMS3 | = 000000 | 10-884 | | | | | | | | |
| AMAMS4 | = 000000 | 10-884 | | | | | | | | |
| AMSGAD | = 000000 | 10-884 | 10-884 | | | | | | | |
| AMSGLG | = 000000 | 10-884 | 10-884 | | | | | | | |
| AMSGTY | = 000000 | 10-884 | 10-884 | | | | | | | |
| AMTYP1 | = 000000 | 10-884 | | | | | | | | |
| AMTYP2 | = 000000 | 10-884 | | | | | | | | |
| AMTYP3 | = 000000 | 10-884 | | | | | | | | |
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| APRIOR | = 000000 | 10-884 | | | | | | | | |
| APTCSU | = 000040 | 34-2939 | #34-2940 | | | | | | | |
| APTENV | = 000001 | 34-2834 | 34-2939 | 34-2940 | #34-2940 | | | | | |
| APTSIZ | = 000200 | 13-1424 | #34-2940 | | | | | | | |
| APTSPO | = 000100 | 34-2939 | 34-2940 | #34-2940 | | | | | | |

| SYMBOL | VALUE | REFERENCES | | | | | | | | |
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| ATESTN | = 000000 | 10-884 | 10-884 | | | | | | | |
| AUNIT | = 000000 | 10-884 | 10-884 | | | | | | | |
| AUSWR | = 000000 | 10-884 | 10-884 | | | | | | | |
| AVECT1 | = 000000 | 10-884 | | | | | | | | |
| AVECT2 | = 000000 | 10-884 | | | | | | | | |
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| BIT0 | = 000001 | #9-807 | | | | | | | | |
| BIT00 | = 000001 | #9-807 | 9-807 | | | | | | | |
| BIT01 | = 000002 | #9-807 | 9-807 | | | | | | | |
| BIT02 | = 000004 | #9-807 | 9-807 | | | | | | | |
| BIT03 | = 000010 | #9-807 | 9-807 | | | | | | | |
| BIT04 | = 000020 | #9-807 | 9-807 | | | | | | | |
| BIT05 | = 000040 | #9-807 | 9-807 | | | | | | | |
| BIT06 | = 000100 | #9-807 | 9-807 | | | | | | | |
| BIT07 | = 000200 | #9-807 | 9-807 | | | | | | | |
| BIT08 | = 000400 | #9-807 | 9-807 | 34-2833 | | | | | | |
| BIT09 | = 001000 | #9-807 | 9-807 | 34-2833 | 34-2834 | | | | | |
| BIT1 | = 000002 | #9-807 | | | | | | | | |
| BIT10 | = 002000 | #9-807 | 34-2834 | | | | | | | |
| BIT11 | = 004000 | #9-807 | | | | | | | | |
| BIT12 | = 010000 | #9-807 | 34-2832 | | | | | | | |
| BIT13 | = 020000 | #9-807 | 19-1770 | 34-2834 | | | | | | |
| BIT14 | = 040000 | #9-807 | 19-1786 | 34-2833 | | | | | | |
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| BIT2 | = 000004 | #9-807 | | | | | | | | |
| BIT3 | = 000010 | #9-807 | | | | | | | | |
| BIT4 | = 000020 | #9-807 | 9-818 | 30-2512 | 30-2562 | | | | | |
| BIT5 | = 000040 | #9-807 | | | | | | | | |
| BIT6 | = 000100 | #9-807 | 9-819 | | | | | | | |
| BIT7 | = 000200 | #9-807 | 15-1442 | 30-2341 | | | | | | |
| BIT8 | = 000400 | #9-807 | 29-2193 | 29-2195 | 29-2234 | 29-2252 | 30-2310 | 30-2311 | 30-2312 | 30-2313 |
| | | 30-2317 | 30-2318 | 30-2319 | 30-2320 | 30-2321 | 30-2322 | 30-2323 | 30-2324 | 30-2325 |
| | | 30-2326 | 30-2327 | 30-2328 | 30-2397 | 30-2540 | | | | |
| BIT9 | = 001000 | #9-807 | | | | | | | | |
| BPTVEC | = 000014 | #9-807 | | | | | | | | |
| CKSWR | = 104410 | 34-2833 | 34-2834 | 34-2834 | #35-2947 | | | | | |
| CLEANU | 002276 | #12-1253 | 21-1913 | 21-1918 | 22-1924 | 23-1930 | 24-1936 | 25-1942 | 25-1960 | 25-1966 |
| | | 25-1972 | 25-1978 | 26-1985 | 26-1991 | | | | | |
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| | | 24-1936 | 24-1936 | 25-1942 | 25-1942 | 30-2289 | 30-2291 | 30-2293 | 30-2295 | 30-2297 |
| | | 30-2299 | | | | | | | | |
| CMSG | 037175 | 34-2926 | #34-2937 | | | | | | | |
| CNTRLC | 037116 | 34-2920 | 34-2920 | #34-2924 | | | | | | |
| CPUERR | = 177766 | #9-823 | *12-1310 | 12-1333 | *12-1340 | *15-1441 | *15-1444 | 30-2471 | *30-2491 | 30-2611 |
| | | *30-2631 | 36-3050 | | | | | | | |
| CPUEXP | 001334 | #10-884 | 12-1335 | 12-1337 | *30-2429 | *30-2444 | *30-2454 | *30-2463 | *30-2568 | *30-2583 |
| | | *30-2593 | *30-2602 | | | | | | | |
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| SYMBOL | VALUE | REFERENCES | | | | | | | | |
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| DATAOR | 001306 | #10-884 | *12-1254 | *12-1276 | *12-1301 | 36-3068 | 36-3069 | | | |
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| DF1 | 050360 | 11-890 | 11-972 | 11-1067 | 11-1169 | 11-1187 | #36-3083 | | | |
| DF10 | 050404 | 11-933 | #36-3087 | | | | | | | |
| DF11 | 050411 | 11-940 | 11-1005 | #36-3088 | | | | | | |
| DF12 | 050416 | 11-947 | #36-3089 | | | | | | | |
| DF16 | 050424 | #36-3090 | | | | | | | | |
| DF2 | 050365 | 11-896 | 11-978 | 11-1023 | 11-1092 | 11-1099 | 11-1129 | 11-1135 | 11-1142 | 11-1148 |
| | | 11-1155 | #36-3084 | | | | | | | |
| DF20 | 050432 | 11-985 | 11-998 | #36-3091 | | | | | | |
| DF24 | 050442 | 11-1011 | 11-1111 | #36-3092 | | | | | | |
| DF3 | 050375 | 11-902 | 11-908 | 11-914 | 11-920 | 11-959 | 11-965 | 11-991 | 11-1017 | 11-1029 |
| | | 11-1035 | 11-1042 | 11-1162 | 11-1181 | #36-3085 | | | | |
| DF32 | 050444 | 11-1048 | #36-3093 | | | | | | | |
| DF33 | 050452 | 11-1054 | #36-3094 | | | | | | | |
| DF43 | 050462 | 11-1105 | #36-3095 | | | | | | | |
| DF7 | 050401 | 11-926 | 11-953 | 11-1079 | 11-1086 | 11-1117 | 11-1123 | 11-1175 | #36-3086 | |
| DH1 | 044647 | 11-888 | #36-3003 | | | | | | | |
| DH10 | 045116 | 11-930 | #36-3007 | | | | | | | |
| DH11 | 045216 | 11-937 | 11-1002 | #36-3009 | | | | | | |
| DH12 | 045336 | 11-944 | #36-3011 | | | | | | | |
| DH13 | 045476 | 11-951 | #36-3013 | | | | | | | |
| DH14 | 045526 | 11-957 | #36-3014 | | | | | | | |
| DH15 | 045566 | 11-963 | #36-3015 | | | | | | | |
| DH16 | 045626 | 11-969 | #36-3016 | | | | | | | |
| DH17 | 045727 | 11-976 | #36-3018 | | | | | | | |
| DH2 | 044727 | 11-894 | 11-1021 | #36-3004 | | | | | | |
| DH20 | 046010 | 11-982 | #36-3019 | | | | | | | |
| DH21 | 046136 | 11-989 | 11-1027 | #36-3021 | | | | | | |
| DH22 | 046176 | 11-995 | #36-3022 | | | | | | | |
| DH24 | 046314 | 11-1009 | 11-1109 | #36-3024 | | | | | | |
| DH3 | 045026 | 11-900 | 11-906 | 11-912 | 11-918 | 11-1015 | #36-3005 | | | |
| DH30 | 046334 | 11-1033 | #36-3025 | | | | | | | |
| DH31 | 046374 | 11-1039 | #36-3026 | | | | | | | |
| DH32 | 046513 | 11-1046 | #36-3028 | | | | | | | |
| DH33 | 046613 | 11-1052 | #36-3029 | | | | | | | |
| DH34 | 046663 | 11-1058 | #36-3030 | | | | | | | |
| DH36 | 046703 | 11-1071 | #36-3031 | | | | | | | |
| DH40 | 046752 | 11-1083 | #36-3032 | | | | | | | |
| DH41 | 047010 | 11-1090 | 11-1133 | #36-3034 | | | | | | |
| DH42 | 047051 | 11-1096 | 11-1139 | 11-1152 | #36-3035 | | | | | |
| DH43 | 047153 | 11-1103 | 11-1146 | #36-3037 | | | | | | |
| DH45 | 047203 | 11-1115 | #36-3038 | | | | | | | |
| DH46 | 047233 | 11-1121 | #36-3039 | | | | | | | |
| DH47 | 047262 | 11-1127 | #36-3040 | | | | | | | |
| DH54 | 047326 | 11-1159 | #36-3041 | | | | | | | |
| DH55 | 047406 | 11-1166 | #36-3043 | | | | | | | |
| DH56 | 047506 | 11-1173 | #36-3045 | | | | | | | |
| DH57 | 047536 | 11-1179 | #36-3046 | | | | | | | |
| DH60 | 047576 | 11-1185 | #36-3047 | | | | | | | |
| DH7 | 045066 | 11-924 | #36-3006 | | | | | | | |

| SYMBOL | VALUE | REFERENCES | | | | | | |
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| DT1 | 047606 | 11-889 | #36-3050 | | | | | |
| DT10 | 047670 | 11-932 | #36-3054 | | | | | |
| DT11 | 047704 | 11-939 | 11-1004 | #36-3055 | | | | |
| DT12 | 047720 | 11-946 | #36-3056 | | | | | |
| DT14 | 047736 | 11-958 | #36-3057 | | | | | |
| DT15 | 047750 | 11-964 | 11-1180 | #36-3058 | | | | |
| DT16 | 047762 | 11-971 | #36-3059 | | | | | |
| DT17 | 047776 | 11-977 | #36-3060 | | | | | |
| DT2 | 047624 | 11-895 | 11-1022 | #36-3051 | | | | |
| DT20 | 050014 | 11-984 | #36-3061 | | | | | |
| DT21 | 050036 | 11-990 | #36-3062 | | | | | |
| DT22 | 050050 | 11-997 | #36-3063 | | | | | |
| DT24 | 050072 | 11-1010 | 11-1110 | #36-3064 | | | | |
| DT25 | 050100 | 11-1016 | #36-3065 | | | | | |
| DT27 | 050112 | 11-1028 | #36-3066 | | | | | |
| DT3 | 047646 | 11-901 | 11-907 | 11-913 | 11-919 | #36-3052 | | |
| DT30 | 050124 | 11-1034 | #36-3067 | | | | | |
| DT31 | 050136 | 11-1041 | #36-3068 | | | | | |
| DT32 | 050154 | 11-1047 | #36-3069 | | | | | |
| DT33 | 050176 | 11-1053 | #36-3070 | | | | | |
| DT35 | 050212 | 11-1066 | #36-3071 | | | | | |
| DT37 | 050222 | 11-1078 | #36-3072 | | | | | |
| DT41 | 050236 | 11-1091 | 11-1134 | #36-3073 | | | | |
| DT42 | 050250 | 11-1098 | 11-1141 | 11-1154 | #36-3074 | | | |
| DT43 | 050264 | 11-1104 | 11-1147 | #36-3075 | | | | |
| DT45 | 050274 | 11-1116 | #36-3076 | | | | | |
| DT47 | 050304 | 11-1128 | #36-3077 | | | | | |
| DT54 | 050316 | 11-1161 | #36-3078 | | | | | |
| DT55 | 050330 | 11-1168 | #36-3079 | | | | | |
| DT56 | 050344 | 11-1174 | #36-3080 | | | | | |
| DT60 | 050354 | 11-1186 | #36-3081 | | | | | |
| DT7 | 047660 | 11-925 | 11-952 | 11-1085 | 11-1122 | #36-3053 | | |
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| EM1 | 041304 | 11-887 | #36-2956 | | | | | |
| EM10 | 041701 | 11-929 | #36-2963 | | | | | |
| EM11 | 041745 | 11-936 | #36-2964 | | | | | |
| EM12 | 042005 | 11-943 | #36-2965 | | | | | |
| EM13 | 042054 | 11-950 | #36-2966 | | | | | |
| EM14 | 042111 | 11-956 | #36-2967 | | | | | |
| EM15 | 042145 | 11-962 | #36-2968 | | | | | |
| EM16 | 042204 | 11-968 | #36-2969 | | | | | |
| EM17 | 042253 | 11-975 | #36-2970 | | | | | |
| EM2 | 041344 | 11-893 | #36-2957 | | | | | |
| EM20 | 042331 | 11-981 | #36-2971 | | | | | |
| EM21 | 042403 | 11-988 | #36-2972 | | | | | |
| EM22 | 042436 | 11-994 | #36-2973 | | | | | |
| EM23 | 042514 | 11-1001 | #36-2974 | | | | | |
| EM24 | 042552 | 11-1008 | #36-2975 | | | | | |

| SYMBOL | VALUE | REFERENCES | | | | | | | |
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| EM25 | 042630 | 11-1014 | #36-2976 | | | | | | |
| EM26 | 042701 | 11-1020 | #36-2977 | | | | | | |
| EM27 | 042741 | 11-1026 | #36-2978 | | | | | | |
| EM3 | 041413 | 11-899 | #36-2958 | | | | | | |
| EM30 | 043015 | 11-1032 | #36-2979 | | | | | | |
| EM31 | 043055 | 11-1038 | #36-2980 | | | | | | |
| EM32 | 043117 | 11-1045 | #36-2981 | | | | | | |
| EM33 | 043161 | 11-1051 | #36-2982 | | | | | | |
| EM34 | 043225 | 11-1057 | #36-2983 | | | | | | |
| EM36 | 043316 | 11-1070 | #36-2984 | | | | | | |
| EM4 | 041452 | 11-905 | #36-2959 | | | | | | |
| EM40 | 043405 | 11-1082 | #36-2985 | | | | | | |
| EM41 | 043470 | 11-1089 | #36-2986 | | | | | | |
| EM42 | 043551 | 11-1095 | #36-2987 | | | | | | |
| EM43 | 043621 | 11-1102 | #36-2988 | | | | | | |
| EM44 | 043677 | 11-1108 | #36-2989 | | | | | | |
| EM45 | 043752 | 11-1114 | #36-2990 | | | | | | |
| EM46 | 044021 | 11-1120 | #36-2991 | | | | | | |
| EM47 | 044074 | 11-1126 | #36-2992 | | | | | | |
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| EM50 | 044132 | 11-1132 | #36-2993 | | | | | | |
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| | | 18-1648 | 18-1654 | 18-1654 | 18-1660 | 18-1660 | 18-1666 | 18-1666 | 18-1672 | 18-1672 |
| | | 18-1693 | 18-1702 | 18-1714 | 18-1723 | 18-1748 | 19-1778 | 19-1783 | 19-1792 | 19-1802 |
| | | 19-1813 | 19-1826 | 19-1838 | 19-1851 | 20-1870 | 20-1877 | 20-1886 | 20-1891 | 21-1913 |
| | | 21-1913 | 21-1918 | 21-1918 | 22-1924 | 22-1924 | 23-1930 | 23-1930 | 24-1936 | 24-1936 |
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| | | 29-2198 | 29-2240 | 29-2259 | 30-2310 | 30-2311 | 30-2312 | 30-2313 | 30-2317 | 30-2318 |
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| | | 30-2328 | 30-2347 | 30-2392 | 30-2402 | 30-2411 | 30-2436 | 30-2450 | 30-2462 | 30-2478 |
| | | 30-2488 | 30-2535 | 30-2545 | 30-2556 | 30-2575 | 30-2589 | 30-2601 | 30-2618 | 30-2628 |
| | | 30-2701 | 31-2764 | 32-2782 | 32-2782 | 32-2782 | 32-2789 | 32-2789 | 32-2789 | 32-2797 |
| | | 32-2797 | 32-2797 | 33-2822 | | | | | | |
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| KDPAR4 | = 172370 | #9-808 | | | | | | | | |
| KDPAR5 | = 172372 | #9-808 | | | | | | | | |
| KDPAR6 | = 172374 | #9-808 | | | | | | | | |
| KDPAR7 | = 172376 | #9-808 | 21-1913 | 21-1913 | 25-1960 | 25-1972 | | | | |
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| KDPDR6 | = 172334 | #9-808 | | | | | | | | |
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| KIPAR2 | = 172344 | #9-808 | *30-2307 | | | | | | | |
| KIPAR3 | = 172346 | #9-808 | *29-2225 | *30-2308 | 32-2782 | | | | | |
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| | | 30-2533 | *30-2548 | 30-2552 | *30-2565 | 30-2624 | *30-2662 | *30-2721 | *30-2742 | |
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| MMR0 | = 177572 | #9-811 *14-1438 17-1551 19-1772 19-1785 19-1793 19-1795 19-1805 19-1816 19-1831 19-1844 19-1854 30-2310 30-2311 30-2312 30-2313 30-2317 30-2318 30-2319 30-2320 30-2321 30-2322 30-2323 30-2324 30-2325 30-2326 30-2327 30-2328 30-2368 |
| MMR1 | = 177574 | #9-812 19-1769 |
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| OLDPS | 001330 | #10-884 *30-2470 30-2492 *30-2610 30-2632 |
| PARCOU | 002400 | #12-1295 25-1960 25-1966 25-1972 25-1978 26-1985 26-1991 |
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| PBAHI | 001304 | #10-884 *12-1417 |
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| | | 22-1923 | 23-1929 | 24-1935 | 25-1941 | 25-1959 | 25-1965 | 25-1971 | 25-1977 | 26-1984 |
| | | 26-1990 | 26-2004 | 26-2009 | 26-2014 | 26-2019 | 26-2024 | 26-2029 | 27-2045 | 27-2073 |
| | | 29-2181 | 29-2222 | 30-2284 | 30-2365 | 30-2509 | 30-2656 | 32-2781 | 32-2787 | 32-2795 |
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| SDPAR4 | = 172270 | #9-808 | | | | | | | | |
| SDPAR5 | = 172272 | #9-808 | | | | | | | | |
| SDPAR6 | = 172274 | #9-808 | | | | | | | | |
| SDPAR7 | = 172276 | #9-808 | 21-1918 | 21-1918 | 25-1966 | | | | | |
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| SDPDR2 | = 172224 | #9-808 | | | | | | | | |
| SDPDR3 | = 172226 | #9-808 | | | | | | | | |
| SDPDR4 | = 172230 | #9-808 | | | | | | | | |
| SDPDR5 | = 172232 | #9-808 | | | | | | | | |
| SDPDR6 | = 172234 | #9-808 | | | | | | | | |
| SDPDR7 | = 172236 | #9-808 | 24-1936 | 24-1936 | 26-1985 | | | | | |
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SYMBOL CROSS REFERENCE  CREF  SEQ 0118

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| | | | 29-2253 | *29-2258 | *30-2688 | 31-2761 | *31-2763 | | | | |
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| SUPSTK | = | 000700 | #9-821 | 17-1555 | | | | | | | |
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| | | | 35-2948 | 35-2948 | | | | | | | |
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| SW14 | = | 040000 | #9-807 | | | | | | | | |
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| SW4 | = | 000020 | #9-807 | | | | | | | | |
| SW5 | = | 000040 | #9-807 | | | | | | | | |
| SW6 | = | 000100 | #9-807 | | | | | | | | |
| SW7 | = | 000200 | #9-807 | | | | | | | | |
| SW8 | = | 000400 | #9-807 | | | | | | | | |
| SW9 | = | 001000 | #9-807 | | | | | | | | |
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| TST43 | 026570 | #27-2073 | | | | | | | | |
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SYMBOL CROSS REFERENCE  CREF

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| MSG16A | #25-1962 | #25-1965 | | | | | | | | |
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| | 26-2014 | 26-2019 | 26-2024 | 26-2029 | 27-2045 | 27-2073 | 29-2181 | 29-2222 | 30-2284 | 30-2365 |
| | 30-2509 | 30-2656 | 32-2781 | 32-2787 | 32-2795 | 33-2810 | | | | |
| PARMSG | #25-1944 | 25-1959 | 25-1965 | 25-1971 | 25-1977 | 26-1984 | 26-1990 | | | |
| POP | #9-807 | 34-2940 | 34-2940 | 34-2943 | 34-2944 | 35-2948 | 35-2948 | | | |
| PUSH | #9-807 | #34-2940 | #34-2940 | #34-2940 | #34-2943 | #34-2944 | #35-2948 | #35-2948 | | |
| REPORT | #9-807 | | | | | | | | | |
| SAVR | #7-499 | 34-2834 | | | | | | | | |
| SETPRI | #9-807 | | | | | | | | | |
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| SETUP | #9-807 | #13-1424 | | | | | | | | |
| SKIP | #9-807 | 17-1576 | 18-1622 | 18-1642 | 18-1648 | 18-1654 | 18-1660 | 18-1666 | 18-1672 | 21-1913 |
| | 21-1918 | 22-1924 | 23-1930 | 24-1936 | 25-1942 | 25-1960 | 25-1966 | 25-1972 | 25-1978 | 26-1985 |
| | 26-1991 | 29-2249 | 30-2465 | 30-2605 | 30-2749 | | | | | |
| SLASH | #9-807 | | | | | | | | | |
| SPACE | #7-496 | #9-807 | | | | | | | | |
| STARS | #9-807 | #9-882 | #9-883 | #9-883 | #9-883 | #10-884 | #10-884 | #10-884 | #12-1193 | #12-1200 |
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| | #12-1315 | #12-1322 | #12-1348 | #12-1355 | #12-1378 | #12-1392 | #16-1460 | #16-1460 | #16-1483 | #16-1483 |
| | #16-1509 | #16-1509 | #17-1550 | #17-1550 | #18-1579 | #18-1591 | #18-1601 | #18-1601 | #18-1641 | #18-1641 |
| | #18-1647 | #18-1647 | #18-1653 | #18-1653 | #18-1659 | #18-1659 | #18-1665 | #18-1665 | #18-1671 | #18-1671 |
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| | #21-1917 | #21-1917 | #22-1923 | #22-1923 | #23-1929 | #23-1929 | #24-1935 | #24-1935 | #25-1941 | #25-1941 |
| | #25-1959 | #25-1959 | #25-1965 | #25-1965 | #25-1971 | #25-1971 | #25-1977 | #25-1977 | #26-1984 | #26-1984 |
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| | #34-2834 | #34-2920 | #34-2920 | #34-2920 | #34-2920 | #34-2939 | #34-2940 | #34-2941 | #34-2942 | #34-2943 |
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| TYPOCT | #9-807 | #34-2920 | | | | | | | | |
| TYPTXT | #9-807 | #34-2832 | #34-2832 | | | | | | | |
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