MRV11-BA

LSI-11-UVPROM-RAM TEST

MD-11-DVMRA-A

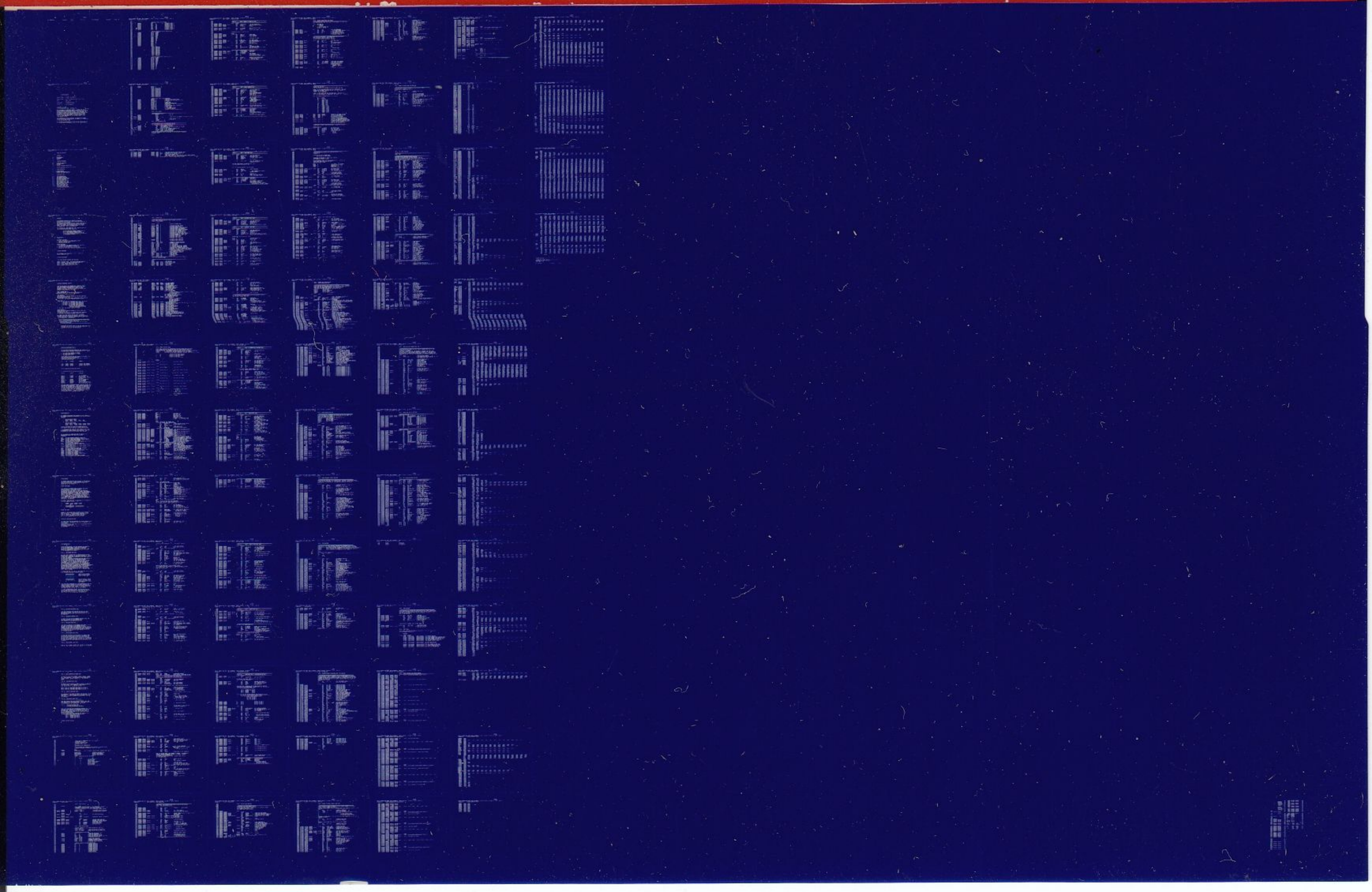
EP-DVMRA-A-DL-A

FICHE 1 OF 1

JUN 1977

digital

MADE IN USA



B01

EOF1D0M9AASE0	00010000	770526	PDP10 411	HDR1DVMRAASE0	00010000	770526

```
.REM %
```

IDENTIFICATION

PRODUCT CODE: MAINDEC-11-DVMRA-A-D
PRODUCT NAME: LSI11 UV PROM-RAM (MRV11-BA) TEST.
DATE: APRIL 1977
MAINTAINER: DIAGNOSTIC GROUP
AUTHOR: GUS PASQUANTONIO

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1.0 ABSTRACT

THIS PROGRAM CONSISTS OF A SERIES OF ROUTINES
DESIGNED TO TEST THE MRV11-BA UV PROM-RAM OPTION ON
AN LSI11 OR 11/03 SYSTEM.
THE PROGRAM ALSO PROVIDES OPTIONAL MEMORY DUMP ROUTINES
WHICH WILL OUTPUT THE CONTENTS OF ANY GIVEN MEMORY
RANGE, IN EITHER OCTAL OR BINARY FORMAT, OR OUTPUT A
32K MEMORY MAP. SEE 7.0 FOR DETAILS.

THE PROGRAM WILL RUN UNDER ACT, APT, AND/OR XXDP WITH
THE FOLLOWING RESTRICTIONS (SEE 4.3):

1. THE 256 WORD RAM ADDRESS JUMPERS MUST BE SET TO THE DEFAULT ADDRESS 020000.
2. THE 4K PROM ADDRESS JUMPERS MUST BE SET TO THE DEFAULT ADDRESS 140000, AND THE PROM SIZE JUMPERS SET FOR 4K.

2.0 REQUIREMENTS

2.1 EQUIPMENT REQUIRED:

1. LSI11 OR 11/03 WITH 4K READ/WRITE MEMORY.
2. CONSOLE TERMINAL (LA36, OR TTY).
3. MRV11-BA UV PROM-RAM.

2.2 MEMORY REQUIRED:

1. 4K READ/WRITE FOR PROGRAM STORAGE AND EXECUTION.
2. 256 WORD RAM (STANDARD IN MRV11-BA).
3. 1K TO 4K UV PROM (OPTIONAL IN MRV11-BA).
4. SPECIAL 4K TEST PROM (IN-HOUSE ENGINEERING USE ONLY).

3.0 LOADING PROCEDURE

USE STANDARD LOAD PROCEDURE FOR PDP-11 ABSOLUTE
BINARY FORMATTED TAPE.

4.0 STARTING PROCEDURE

FIVE START-RESTART ADDRESS ARE PROVIDED:

00200 = INITIAL START. INITIALIZE PROM-RAM ADDRESSES.
00204 = RESTART. RE-USE OLD PROM-RAM ADDRESSES.
00210 = OCTAL MEMORY DUMP START (SEE 7.1).
00214 = BINARY MEMORY DUMP START (SEE 7.1).
00220 = MEMORY MAP DUMP START (SEE 7.2).

STARTING PROCEDURE (CONT'D)

4.1 UPON INITIAL START THE PROGRAM WILL IDENTIFY ITSELF, TYPE THE CURRENT SWITCH REGISTER CONTENTS (SEE 5.0), AND BEGIN A BRIEF CONVERSATION IN WHICH THE RAM ADDRESS, PROM SIZE, AND PROM ADDRESS ARE ESTABLISHED. RESPOND TO EACH QUERY AS FOLLOWS:

"SWR = 000000 NEW = "
ENTER THE DESIRED SWITCH REGISTER CONTENTS AND TERMINATE WITH <CR>. SEE 5.0 FOR DETAILS.

"RAM ADDRESS = "
ENTER THE OCTAL STARTING ADDRESS OF THE 256 WORD RAM, AND TERMINATE WITH <CR>.
ADDRESS MUST BE ON A 256 WORD (1000 OCTAL BYTE) BOUNDARY.
IF <CR> ONLY, THE DEFAULT ADDRESS 020000 IS USED.

"PROM SIZE = "
ENTER THE PROM SIZE AND TERMINATE WITH <CR>, AS FOLLOWS:

1	(OR 1024)	= 1K OPTIONAL PROM INSTALLED.
2	(OR 2048)	= 2K OPTIONAL PROM INSTALLED.
3	(OR 3072)	= 3K OPTIONAL PROM INSTALLED.
4	(OR 4096)	= 4K OPTIONAL PROM INSTALLED.
X		= SPECIAL 4K TEST PROM INSTALLED. (IN-HOUSE ENGINEERING USE ONLY)

IF <CR> ONLY, THE DEFAULT SIZE 4K IS USED.

"PROM ADDRESS = "
ENTER THE OCTAL STARTING ADDRESS OF THE 4K PROM, AND TERMINATE WITH <CR>.
THE ADDRESS MUST BE ON A 1K (4000 OCTAL BYTE) BOUNDARY.
IF <CR> ONLY, THE DEFAULT ADDRESS 140000 IS USED.

ALL INPUT DATA ARE TESTED FOR VALIDITY (ON PROPER BOUNDARY AND NOT NON-EXISTANT ADDRESS) BEFORE PROCEEDING TO THE NEXT QUERY. WHEN AN INVALID INPUT IS MADE, THAT INPUT REQUEST WILL BE REPEATED.

****
NOTE: VALID PROM ENTRIES MUST BE MADE EVEN THOUGH THERE MAY BE NO PROM PHYSICALLY INSTALLED.
THE PROM TESTS (11 AND 12) WILL RUN WITH OR WITHOUT PROM CHIPS INSTALLED.
****

4.2 SUBSEQUENT RE-STARTS FROM LOC 204 WILL OMIT THE INITIAL DIALOGUE AND USE THE SIZE AND ADDRESS PARAMETERS OBTAINED AT THE LAST INITIALIZATION.

STARTING PROCEDURE (CONT'D)

4.3 THE FOLLOWING PROM-RAM PARAMETERS ARE ASSUMED BY THE PROGRAM UNLESS OTHERWISE ESTABLISHED AS IN 4.1 ABOVE:

1. THE FIRST RAM ADDRESS IS 020000.
2. THE FIRST PROM ADDRESS IS 140000.
3. THE PROM SIZE IS 4K.

THESE DEFAULT VALUES MAY BE ALTERED IF NECESSARY TO MEET SOME SPECIFIC CONFIGURATION.
CHANGE THE FOLLOWING MEMORY LOCATIONS TO CONFORM TO YOUR PARTICULAR SYSTEM:

LOC	TAG	CONTENT	COMMENT
1250	$BASE:	020000	;DEFAULT RAM ADDRESS.
1254	$CDW1:	140000	;DEFAULT PROM ADDRESS.
1256	$CDW2:	000004	;DEFAULT PROM SIZE (K).

5.0 SWITCH REGISTER OPTIONS AND CONTROL.

THE FOLLOWING SWITCH OPTIONS ARE PROVIDED:

SWITCH	OCTAL	FUNCTION
SWR15=1	100000	HALT ON ERROR.
SWR14=1	040000	LOOP ON TEST.
SWR13=1	020000	INHIBIT ERROR TYPEOUTS
SWR12=1		NOT USED.
SWR11=1	004000	INHIBIT ITERATIONS.
SWR10=1	002000	BELL ON ERROR.
SWR09=1	001000	LOOP ON ERROR.
SWR08=1	000400	LOOP ON TEST SWR <7:0>
SWR<7:0>	0004XX	TEST # FOR SWR 8 OPTION.

THE LSI11 USES A DEDICATED MEMORY LOCATION (00176) AS A SOFTWARE SWITCH REGISTER. THIS LOCATION FUNCTIONS THE SAME AS THE HARDWARE SWITCH REGISTER IN OTHER PDP-11'S. THE SOFT SWITCH REGISTER IS DISPLAYED AND/OR CHANGED AT INITIAL START TIME, AND THEREAFTER MAY BE ALTERED BY TYPING "CNTRL G" <↑G>. THE PROGRAM WILL TYPE THE CURRENT SWR CONTENTS. ENTER THE NEW VALUE, IF ANY, AND TERMINATE WITH "CARRIAGE RETURN" <CR>.

6.0 ERROR REPORTING

ANY ERRORS ENCOUNTERED ARE REPORTED ON THE CONSOLE TTY.
EACH ERROR SIGNATURE IS CONSISTENT WITH THE FOLLOWING
EXAMPLES;

```
RAM READ-WRITE ERROR.
TEST#   ERRPC   ADDR     GOOD     BAD
OOOOMN  XXXXXX  YYYYYY  177777  000000

PROM-RAM COPY ERROR.
TEST#   ERRPC   PRMADD  PRMDAT  RAMADD  RAMDAT
OOOOMN  XXXXXX  140000  010000  023000  000000
```

TESTING CONTINUES FOLLOWING ANY ERROR UNLESS THE
LOOP (SWR 9) OR HALT (SWR 15) OPTIONS ARE SELECTED.

IF AN UNFORSEEN BUS TIME-OUT TRAP OCCURS AT ANY TIME,
AN APPROPRIATE ERROR MESSAGE WILL BE OUTPUT, AND THE
PROCESSER WILL HALT AT LOC "STOP" (SEE LISTING).

THE FOLLOWING KEY WORDS ARE USED TO IDENTIFY THE
VARIOUS DATA WORDS THAT MAKE UP AN ERROR
SIGNATURE:

ADDR	THE WORD ADDRESS CURRENTLY UNDER TEST.
ADDR-2	THE NEXT LOWER WORD ADDRESS (TESTS 5 AND 6).
ADDR+2	THE NEXT HIGHER WORD ADDRESS (TESTS 5 AND 6).
BAD	THE BAD (FAILING) DATA WORD.
BUFDAT	THE CONTENTS OF AN INTERNAL BUFFER COPY OF RAM LOCATION "ADDR" (TEST 4).
BYTE	THE FAILING BYTE ADDRESS (TEST 10).
DATIS	THE CONTENTS OF PROM LOC "ADDR" AFTER A WRITE ATTEMPT (TEST 12).
DATWAS	THE CONTENTS OF PROM LOC "ADDR" BEFORE A WRITE ATTEMPT (TEST 12).
ERRPC	THE PC AT WHICH THE ERROR CALL OCCURRED.
GOOD	THE GOOD (EXPECTED) DATA WORD.
PATRN	THE CURRENT TEST BIT PATTERN (TESTS 5 AND 6).
PRMADD	THE CURRENT PROM ADDRESS (TEST 11).
PRMDAT	THE CONTENTS OF "PRMADD".
RAMADD	THE CURRENT RAM ADDRESS (TEST 11).
RAMDAT	THE CONTENTS OF "RAMADD" (TESTS 4 AND 11).
TEST#	THE CURRENT TEST NUMBER.
TRAPPC	THE PC AT WHICH A BUS-ERROR OCCURRED.
TRAPPS	THE PROCESSOR STATUS WHEN BUS-ERROR OCCURRED.

7.0 MISCELLANEOUS

TWO MEMORY DUMP ROUTINES ARE INCLUDED IN THE PROM-RAM TEST FOR CONVENIENCE. THESE ROUTINES WILL DUMP THE CONTENTS OF ANY GIVEN MEMORY RANGE, OR DUMP A 32K MEMORY MAP ON THE CONSOLE TTY.

7.1 MEMORY DATA DUMP.

THIS ROUTINE IS STARTED FROM LOC 00210 (FOR OCTAL OUTPUT) OR 00214 (FOR BINARY OUTPUT).
THE OPERATOR WILL BE ASKED TO INPUT THE STARTING ADDRESS AND THE WORD COUNT OF THE RANGE TO BE DUMPED.
ODD ADDRESS INPUTS ARE ACCEPTED, BUT THE DUMP RANGE WILL START AT THAT ADDRESS -1. WORD COUNT INPUT MUST BE GREATER THAN ZERO. THE DUMP RANGE IS CHECKED FOR VALIDITY, AND IF OK, THAT RANGE WILL BE TYPED ON THE TTY, 4 WORDS/LINE OCTAL, OR 2 WORDS/LINE BINARY.
IF THE DUMP RANGE IS INVALID (NON-EXISTANT ADDRESS OR WORD COUNT = 0) THE STARTING ADDRESS AND WORD COUNT QUERIES WILL BE REPEATED.

ON OUTPUT, EACH DATA SET IS PRECEEDED BY THE ADDRESS OF THE FIRST WORD OF THE SET. I.E.

```
 0      000000  111111  022222  133333
10      044444  155555  066666  177777
                  OR
 0      0000000000000000  1001001001001001
 4      0010010010010010  0011011011011011
                ETC.
```

7.2 MEMORY MAP DUMP.

NORMALLY A 32K MEMORY MAP IS OUTPUT AS AN INTEGRAL PART OF TEST #1. FOR MAINTENANCE PURPOSES, A START FROM LOC 00220 WILL FORCE A SINGLE PASS ENTRY TO TEST #1, OUTPUT THE RESULTING MAP, AND HALT.
SEE 9.1 FOR A DESCRIPTION OF THE MAP FORMAT.

8.0 EXECUTION TIME AND END PASS

THE FIRST PASS THRU THE PROGRAM IS A "QUICK VERIFY" WITH NO ITERATIONS. THEREAFTER, EACH TEST IS REPEATED 100 OCTAL TIMES.
EXECUTION TIME WILL VARY FROM 70 TO 150 SECONDS PER PASS DEPENDING ON PROM SIZE.
THE PROGRAM WILL TYPE "END PASS # X" AT THE CONCLUSION OF EACH PASS.

9.0 TEST DESCRIPTION

AFTER INITIALIZATION, THE TEST SEQUENCE IS CONDUCTED IN THE FOLLOWING ORDER. EACH TEST IS REPEATED 100 OCTAL TIMES BEFORE PROCEEDING TO THE NEXT. ANY ERRORS OR DISCREPANCIES ARE REPORTED ON THE CONSOLE TTY AS DESCRIBED IN 6.0 ABOVE.

9.1 TEST 1. 32K MEMORY MAP TEST.

FOR THIS TEST A MEMORY MAP IS CONSTRUCTED BY TESTING MEMORY FROM 0 THRU 32K, IN 256 WORD INCREMENTS. TESTING IS DONE VIA A READ/WRITE SEQUENCE ON THE FIRST WORD OF OF EACH 256 SEGMENT.
THE MAP THUS OBTAINED DESCRIBES EACH 256 WORD SEGMENT AS NON-EXISTANT, READ-ONLY, OR READ/WRITE MEMORY.
THE MAP INVOLVES THE USE OF 2 WORDS FOR EACH 4K BANK (16. WORDS). ON THE INITIAL PASS EACH MAP PAIR IS TRANSLATED INTO A 16 CHARACTER STRING COMPOSED OF THE CHARACTERS (R) FOR READ ONLY, (W) FOR READ/WRITE, AND (-) FOR NON-EXISTANT, AND OUTPUT AS SHOWN BELOW.
ON SUBSEQUENT PASSES, A NEW MAP IS CONSTRUCTED AND COMPARED AGAINST THE ORIGINAL (REFERENCE) MAP. ANY DIFFERENCES ARE INTERPRETED AS ERRORS AND REPORTED ACCORDINGLY.
NORMALLY THE MAP IS PRINTED ONLY ONCE, UPON INITIAL START FROM LOC 00200, AND NOT AT ALL IF RUNNING UNDER ACT11, APT11, OR XXDP.

A TYPICAL MAP FOR A 4K LSI-11, WITH MRV11-BA, AND 4K PROM MIGHT APPEAR AS FOLLOWS (COMMENTS ADDED):

```
WWWWWWWWWWWWWWWW        BANK 0 IS R/W MEMORY.
W---------------        RAM AT DEFAULT 020000
----------------        BANKS 2-5 ARE NEXM
----------------
----------------
----------------
RRRRRRRRRRRRRRRR        PROM AT DEFAULT 140000
-----R-----R----        BANK 7 (I/O PAGE) WITH
                        BOOTSTRAP ROM AT 165000,
                        AND 173000.
```

NOTE THAT EACH CHARACTER IN A LINE REPRESENTS A 256 WORD (1000 OCTAL BYTE) SEGMENT OF THAT BANK, STARTING AT ADDRESS X+00000 (LEFTMOST CHAR), AND ENDING AT ADDRESS X+17000 (RIGHTMOST CHAR), WHERE X = THE BANK BITS FOR THAT BANK (00, 02, 04, 06, 10, 12, 14, OR 16).

IF A MAP COMPARE ERROR OCCURS, THE MAP PAIR FOR THE FAILING BANK ARE TRANSLATED AS ABOVE AND THE RESULTING MAP LINE IS OUTPUT ON THE TTY. ONE SHOULD ALWAYS SAVE A COPY OF THE 1ST PASS MAP FOR REFERENCE.

9.2 TEST 2. RAM ONES AND ZEROS TEST.

THIS TEST VERIFIES THAT THE RAM CAN HOLD ALL ONES,
AND THEN ALL ZEROS. THE RAM IS FILLED WITH THE
APPROPRIATE DATA PATTERN, THEN EACH LOCATION IS READ
AND VERIFIED.

9.3 TEST 3. RAM BASIC ADDRESS TEST.

THE RAM IS FILLED WITH AN ADDRESS PATTERN WHERE EACH
LOCATION CONTAINS ITS OWN ADDRESS WORD.
EACH ADDRESS IS THEN READ AND VERIFIED.

9.4 TEST 4. RAM FAST READ TEST.

THIS TEST IS SIMILAR TO THE ADDRESS TEST ABOVE, IN THAT
THE DATA PATTERN USED IS AN ADDRESS PATTERN.
HOWEVER, IN THIS CASE THE ENTIRE RAM IS COPIED INTO AN
INTERNAL BUFFER USING 256 CONSECUTIVE "MOV" INSTRUCTIONS.
THE INTENT HERE IS TO HIT THE RAM AS FAST AS POSSIBLE.
THE CONTENTS OF THE RAM ARE THEN COMPARED TO THAT OF
THE INTERNAL BUFFER.

9.5 TEST 5. RAM SLIDING 0 BIT TEST.

IN THIS TEST THE RAM IS FILLED WITH 1'S, THEN A WORD
CONTAINING A SINGLE 0 BIT IS WRITTEN, BEGINNING WITH
BIT 0 OF WORD 0, AND ENDING WITH BIT 15 OF WORD 255.
AS EACH 0 BIT IS WRITTEN, THAT LOCATION (N) IS VERIFIED,
AND THE TWO ADJACENT LOCATIONS (N-2 AND N+2) ARE TESTED
TO VERIFY THAT THEY WERE UNAFFECTED BY THE WRITING INTO
LOCATION N.

9.6 TEST 6. RAM SLIDING 1 BIT TEST.

SAME AS TEST 4 ABOVE, EXCEPT THAT THE RAM IS INITIALIZED
WITH 0'S, AND A WORD CONTAINING A SINGLE 1 BIT IS WRITTEN.

9.7 TEST 7. RAM ALTERNATE BIT/WORD TEST.

THE RAM IS FILLED WITH 052525, 125252, 052525, 125252, ETC., AND VERIFIED. THE PATTERN IS THEN COMPLIMENTED 125252, 052525, 125252, 052525, ETC., AND VERIFIED AGAIN.

9.8 TEST 10. RAM WRITE BYTE TEST.

THE RAM IS FILLED WITH 1'S, AND A LO BYTE 0 IS WRITTEN INTO EACH WORD. EACH ADDRESS IS THEN CHECKED TO SEE THAT THE HI BYTE = -1, AND THE LO BYTE = 0.

REFILL WITH 1'S, AND WRITE AND CHECK A HI BYTE 0.
REFILL WITH 0'S, AND WRITE AND CHECK A LO BYTE -1.
REFILL WITH 0'S, AND WRITE AND CHECK A HI BYTE -1.

9.9 TEST 11. PROM TO RAM COPY TEST.

THE CONTENTS OF THE PROM IS COPIED INTO THE RAM, IN 256 WORD PACKETS. THEN THE RAM DATA IS COMPARED WITH THE PROM DATA. THE COPY-COMPARE CONTINUES UNTIL THE PROM IS EXHAUSTED.

9.10 TEST 12. PROM WRITE-TRAP TEST.

THIS TEST CHECKS THAT ANY ATTEMPT TO WRITE INTO THE PROM RESULTS IN A "BUS ERROR TRAP". ALL PROM ADDRESSES AS DETERMINED BY THE "PROM SIZE", ARE TESTED.

9.11 TEST 13. PROM DATA PATTERN TEST
(IN-HOUSE ENGINEERING USE ONLY)

TEST 13 IS INCLUDED FOR ENGINEERING PURPOSES ONLY, AND REQUIRES THAT A SPECIAL 4K PROGRAMMED PROM CHIP SET BE INSTALLED. ENTRY INTO THE TEST IS ONLY MADE IF THE "X" RESPONSE WAS GIVEN TO THE "PROM SIZE" QUERY DURING INITIALIZATION.
THE TEST READS EACH PROM LOCATION AND VERIFIES THAT THE FOLLOWING BINARY COUNT PATTERN IS READ:

1ST K	010000 THRU 011777
2ND K	022000 THRU 023777
3RD K	044000 THRU 045777
4TH K	106000 THRU 107777

10.0 PROGRAM LISTING FOLLOWS:

```
        %
   487
   488                                  .TITLE  LSI-11 UVPROM-RAM TEST. MD-11-DVMRA-A.
   489                                  ;*COPYRIGHT (C) 1977
   490                                  ;*DIGITAL EQUIPMENT CORP.
   491                                  ;*MAYNARD, MASS. 01754
   492                                  ;*
   493                                  ;*PROGRAM BY GUS PASQUANTONIO
   494                                  ;*
   495                                  ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
   496                                  ;*PACKAGE (MAINDEC-11-DZQAC-C2), SEPT 14, 1976.
   497                                  ;*
   498           000001                 $TN=1
   499           160000                 $SWR=160000     ;;HALT ON ERROR, LOOP ON TEST, INHIBIT ERROR TYPOUT
   500
   501           167400                 $SWR=167400                     ;REDEFINE SWITCHES USED.
   502           020000                 ABASE=020000                    ;DEFAULT RAM ADDRESS
   503           140000                 ACDW1=140000                    ;DEFAULT PROM ADDRESS
   504           000004                 ACDW2=4                         ;DEFAULT PROM SIZE IN K.
   505                                  .SBTTL  OPERATIONAL SWITCH SETTINGS
   506                                  ;*
   507                                  ;*      SWITCH                  USE
   508                                  ;*      ------          --------------------
   509                                  ;*        15            HALT ON ERROR
   510                                  ;*        14            LOOP ON TEST
   511                                  ;*        13            INHIBIT ERROR TYPEOUTS
   512                                  ;*        11            INHIBIT ITERATIONS
   513                                  ;*        10            BELL ON ERROR
   514                                  ;*         9            LOOP ON ERROR
   515                                  ;*         8            LOOP ON TEST IN SWR<7:0>
```

```
                                        .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

                    000004                      .=4
000004  006676  000000              .WORD   TIMOUT,0        ;BUS ERROR PROCESSER.

                    000100                      .=100
000100  000104  000200  000002      .WORD   104,200,2       ;IGNORE ANY "BEVNT" INTERRUPTS

                    000200                      .=200
000200  000137  001436              JMP     @#START         ;INITIAL START AND INIT.
000204  000137  002620              JMP     @#RSTRT         ;RESTART. USE SAME PROM/RAM
                                                            ;PARAMETERS. NO MAP OUTPUT.
000210  000137  007174              JMP     @#ODUMP         ;OCTAL DUMP START
000214  000137  007276              JMP     @#BDUMP         ;BINARY DUMP START
000220  000137  007124              JMP     @#MDUMP         ;MAP DUMP START

                                        .SBTTL  BASIC DEFINITIONS

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

                                        ;*MISCELLANEOUS DEFINITIONS
                    000011              HT=     11              ;;CODE FOR HORIZONTAL TAB
                    000012              LF=     12              ;;CODE FOR LINE FEED
                    000015              CR=     15              ;;CODE FOR CARRIAGE RETURN
                    000200              CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
                    177776              PS=     177776          ;;PROCESSOR STATUS WORD
                                        .EQUIV  PS,PSW
                    177774              STKLMT= 177774          ;;STACK LIMIT REGISTER
                    177772              PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
                    177570              DSWR=   177570          ;;HARDWARE SWITCH REGISTER
                    177570              DDISP=  177570          ;;HARDWARE DISPLAY REGISTER

                                        ;*GENERAL PURPOSE REGISTER DEFINITIONS
                    000000              R0=     %0              ;;GENERAL REGISTER
                    000001              R1=     %1              ;;GENERAL REGISTER
                    000002              R2=     %2              ;;GENERAL REGISTER
                    000003              R3=     %3              ;;GENERAL REGISTER
                    000004              R4=     %4              ;;GENERAL REGISTER
                    000005              R5=     %5              ;;GENERAL REGISTER
                    000006              R6=     %6              ;;GENERAL REGISTER
                    000007              R7=     %7              ;;GENERAL REGISTER
                    000006              SP=     %6              ;;STACK POINTER
                    000007              PC=     %7              ;;PROGRAM COUNTER
```

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

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

                                ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
100000                  BIT15=  100000
040000                  BIT14=  40000
020000                  BIT13=  20000
010000                  BIT12=  10000
004000                  BIT11=  4000
002000                  BIT10=  2000
001000                  BIT09=  1000
000400                  BIT08=  400
000200                  BIT07=  200
000100                  BIT06=  100
000040                  BIT05=  40
000020                  BIT04=  20
000010                  BIT03=  10
000004                  BIT02=  4
```

```
                        000002          BIT01=  2
                        000001          BIT00=  1
                                        .EQUIV  BIT09,BIT9
                                        .EQUIV  BIT08,BIT8
                                        .EQUIV  BIT07,BIT7
                                        .EQUIV  BIT06,BIT6
                                        .EQUIV  BIT05,BIT5
                                        .EQUIV  BIT04,BIT4
                                        .EQUIV  BIT03,BIT3
                                        .EQUIV  BIT02,BIT2
                                        .EQUIV  BIT01,BIT1
                                        .EQUIV  BIT00,BIT0

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

                                        .SBTTL  ACT11 HOOKS

                                        ;;**************************************************************
                                        ;HOOKS REQUIRED BY ACT11
                        000224                  $SVPC=.                 ;SAVE PC
                        000046                  .=46
                000046  006626                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
                        000052                  .=52
                000052  000000                  .WORD   0               ;;2)SET LOC.52 TO ZERO
                        000224                  .=$SVPC                 ;; RESTORE PC
                        001000                  .=1000
                                        .SBTTL  APT PARAMETER BLOCK

                                        ;;**************************************************************
                                        ;SET LOCATIONS 24 AND 44 AS REQUIRED FOR APT
                                        ;;**************************************************************
                        001000                  .$X=.   ;;SAVE CURRENT LOCATION
                        000024                  .=24    ;;SET POWER FAIL TO POINT TO START OF PROGRAM
                000024  000200                  200     ;;FOR APT START UP
                        000044                  .=44    ;;POINT TO APT INDIRECT ADDRESS PNTR.
                000044  001000                  $APTHDR ;;POINT TO APT HEADER BLOCK
                        001000                  .=.$X   ;;RESET LOCATION COUNTER
                                        ;;**************************************************************
                                        ;SETUP APT PARAMETER BLOCK AS DEFINED IN THE APT-PDP11 DIAGNOSTIC
                                        ;INTERFACE SPEC.

                001000                  $APTHD:
```

```
   678  001000  000000                SHIBTS: .WORD   0           ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
   679  001002  001174                SMBADR: .WORD   $MAIL       ;;ADDRESS OF APT MAILBOX (BITS 0-15)
   680  001004  000055                SISTM:  .WORD   45.         ;;RUN TIM OF LONGEST TEST
   681  001006  000005                SPASTM: .WORD   5.          ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
   682  001010  000005                SUNITM: .WORD   5.          ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
   683  001012  000032                        .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                  SCMTAG:                         ;;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                  $TIMES: 0               ;;MAX. NUMBER OF ITERATIONS
001162  000000                  $ESCAPE:0               ;;ESCAPE ON ERROR ADDRESS
001164  177607  000377        $BELL:  .ASCIZ  <207><377><377> ;;CODE FOR BELL
001170  077                     $QUES:  .ASCII  /?/     ;;QUESTION MARK
001171  015                     $CRLF:  .ASCII  <15>    ;;CARRIAGE RETURN
001172  000012                  $LF:    .ASCIZ  <12>    ;;LINE FEED
                                ;;*****************************************************************
                                .SBTTL  APT MAILBOX-ETABLE

                                ;;*****************************************************************
                                .EVEN
001174                          $MAIL:                  ;;APT MAILBOX
001174  000000                  $MSGTY: .WORD   AMSGTY   ;;MESSAGE TYPE CODE
001176  000000                  $FATAL: .WORD   AFATAL   ;;FATAL ERROR NUMBER
001200  000000                  $TESTN: .WORD   ATESTN   ;;TEST NUMBER
001202  000000                  $PASS:  .WORD   APASS    ;;PASS COUNT
001204  000000                  $DEVCT: .WORD   ADEVCT   ;;DEVICE COUNT
```

```
001206  000000                  SUNII:  .WORD   AUNII   ;;I/O UNIT NUMBER
001210  000000                  SMSGAD: .WORD   AMSGAD  ;;MESSAGE ADDRESS
001212  000000                  SMSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
001214                          SETABLE:                ;;APT ENVIRONMENT TABLE
001214     000                  SENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
001215     000                  SENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
001216  000000                  SSWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
001220  000000                  SUSWR:  .WORD   AUSWR   ;;USER SWITCHES
001222  000000                  SCPUOP: .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
001224     000                  SMAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
001225     000                  SMTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
                                ;*                      MEM.TYPE BYTE   --  (HIGH BYTE)
                                ;*                           900 NSEC CORE=001
                                ;*                           300 NSEC BIPOLAR=002
                                ;*                           500 NSEC MOS=003
001226  000000                  SMADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
                                ;*                      MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
001230     000                  SMAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
001231     000                  SMTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
001232  000000                  SMADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
001234     000                  SMAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
001235     000                  SMTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
001236  000000                  SMADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
001240     000                  SMAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
001241     000                  SMTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
001242  000000                  SMADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
001244  000000                  SVECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
001246  000000                  SVECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
001250  020000                  SBASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
001252  000000                  SDEVM:  .WORD   ADEVM   ;;DEVICE MAP
001254  140000                  SCDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
001256  000004                  SCDW2:  .WORD   ACDW2   ;;CONTROLLER DESCRIPTION WORD#2
001260                          SETEND:
                                .MEXIT
```

```
                                        .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


001260                                  $ERRTB:
                                        ;ITEM1
001260  013436  013464  013516                  EM1,DH1,DT1,DF          ;READ-WRITE ERROR
001266  015110
                                        ;ITEM2
001270  013532  013555  013610                  EM2,DH2,DT2,DF          ;BASIC ADDRESS TEST.
001276  015110
                                        ;ITEM3
001300  013624  013651  013716                  EM3,DH3,DT3,DF          ;FAST READ TEST.
001306  015110
                                        ;ITEM4
001310  013734  014002  014050                  EM4,DH4,DT4,DF          ;SLIDE TEST. ADDR-2 ALTERED.
001316  015110
                                        ;ITEM5
001320  014070  014136  014204                  EM5,DH5,DT5,DF          ;SLIDE TEST. ADDR+2 ALTERED.
001326  015110
                                        ;ITEM6
001330  014224  014265  014320                  EM6,DH6,DT6,DF          ;ALTERNATE BIT ERROR.
001336  015110
                                        ;ITEM7
001340  014334  014361  014420                  EM7,DH7,DT7,DF          ;RAM BYTE TEST ERROR
001346  015110
                                        ;ITEM10
001350  014436  014457  014512                  EM10,DH10,DT10,DF       ;PROM SPECIAL DATA TEST READ ERROR
001356  015110
                                        ;ITEM11
001360  014526  014553  014624                  EM11,DH11,DT11,DF       ;PROM TO RAM COPY ERROR.
001366  015110
                                        ;ITEM12
001370  014642  014671  014730                  EM12,DH12,DT12,DF       ;PROM WRITE TRAP FAILURE.
001376  015110
                                        ;ITEM13
001400  014744  014777  015024                  EM13,DH13,DT13,DF       ;BUS TIME-OUT (TRAP) ERROR.
001406  015110
                                        ;ITEM14
001410  015034  000000  000000                  EM14,0,0,0              ;MEM MAP ERROR.
001416  000000
                                                                        ;NON-STANDARD MAP SIGNATURE.
                                                                        ;DH, DT, AND DF = 0
```

```
                                        .SBTTL  INITIAL START-UP.
001420  000000                  RAM:    0                       ;RAM START LOC.
001422  000000                  RAMEND: 0                       ;RAM LAST LOC
001424  000000                  PRM:    0                       ;PROM START LOC
001426  000000                  PRMEND: 0                       ;PROM LAST LOC
001430  000000                  PRMSZ:  0                       ;PROM SIZE (IN K)
001432  000000                  PRMX:   0                       ;0 NORM, -1 IF SPECIAL 4K SET.
001434  000000                  MAINT:  0                       ;0 NORM, -1 IF ANY DUMP START.

001436                          START:
                                .SBTTL  INITIALIZE THE COMMON TAGS
                                ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
001436  012706  001100                  MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
001442  005026                  1$:     CLR     (R6)+           ;;CLEAR MEMORY LOCATION
001444  022706  001140                  CMP     #$WR,R6 ;;DONE?
001450  001374                          BNE     .-6             ;;LOOP BACK IF NO
001452  012706  001100                  MOV     #$TACK,SP       ;;SETUP THE STACK POINTER
                                ;;INITIALIZE A FEW VECTORS
001456  012737  007654  000020          MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
001464  012737  000340  000022          MOV     #340,@#IOTVEC+2 ;;LEVEL 7
001472  012737  010214  000030          MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
001500  012737  000340  000032          MOV     #340,@#EMTVEC+2 ;;LEVEL 7
001506  012737  013120  000034          MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
001514  012737  000340  000036          MOV     #340,@#TRAPVEC+2;LEVEL 7
001522  012737  012474  000024          MOV     #$PWRDN,@#PWRVEC ;;POWER FAILURE VECTOR
001530  012737  000340  000026          MOV     #340,@#PWRVEC+2 ;;LEVEL 7
001536  013737  006574  006566          MOV     $ENDCT,$ENDPCT  ;;SETUP END-OF-PROGRAM COUNTER
001544  005037  001160                  CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
001550  005037  001162                  CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
001554  112737  000001  001115          MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
001562  012737  001562  001106          MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
001570  012737  001570  001110          MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
                                ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
                                ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
001576  013746  000004                  MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
001602  012737  001636  000004          MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
001610  012737  177570  001140          MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
001616  012737  177570  001142          MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
001624  022777  177777  177306          CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
001632  001012                          BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
                                                                ;;AND  THE HARDWARE SWR IS NOT = -1
001634  000403                          BR      65$             ;;BRANCH IF NO TIMEOUT
001636  012716  001644          64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
001642  000002                          RTI
001644  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
001652  012737  000174  001142          MOV     #DISPREG,DISPLAY
001660  012637  000004          66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR

001664  005037  001202                  CLR     $PASS           ;;CLEAR PASS COUNT
001670  132737  000200  001215          BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
001676  001403                          BEQ     67$             ;;YES,USE NON-APT SWITCH
001700  012737  001216  001140          MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
001706                          67$:
```

```
001706  005737  001434                 TST     MAINT           ;MAINT FLAG SET ??
001712  001401                         BEQ     .+4             ;NO, PROCEED WITH NORMAL START.
001714  000207                         RTS     PC              ;YES, RETURN TO MAINT ROUTINE.

                                .SBTTL  TYPE PROGRAM NAME
                                ;;TYPE THE NAME OF THE PROGRAM IF FIRST PASS
001716  005227  177777                 INC     #-1             ;;FIRST TIME?
001722  001054                         BNE     68$             ;;BRANCH IF NO
001724  022737  006626  000042         CMP     #$ENDAD,@#42    ;;ACT-11?
001732  001450                         BEQ     68$             ;;BRANCH IF YES
001734  104401  002002                 TYPE    ,69$            ;;TYPE ASCIZ STRING
                                .SBTTL  GET VALUE FOR SOFTWARE SWITCH REGISTER
001740  005737  000042                 TST     @#42            ;;ARE WE RUNNING UNDER XXDP/ACT?
001744  001012                         BNE     70$             ;;BRANCH IF YES
001746  123727  001214  000001         CMPB    $ENV,#1         ;;ARE WE RUNNING UNDER APT?
001754  001406                         BEQ     70$             ;;BRANCH IF YES
001756  023727  001140  000176         CMP     SWR,#SWREG      ;;SOFTWARE SWITCH REG SELECTED?
001764  001005                         BNE     71$             ;;BRANCH IF NO
001766  104407                         GTSWR                   ;;GET SOFT-SWR SETTINGS
001770  000403                         BR      71$
001772  112737  000001  001134 70$:    MOVB    #1,$AUTOB       ;;SET AUTO-MODE INDICATOR
002000                          71$:
002000  000425                         BR      68$             ;;GET OVER THE ASCIZ
                                ;;69$:  .ASCIZ  <CRLF>/MD-11-DVMRA-A.  LSI-11 UVPROM-RAM TEST./<CRLF>
002054                          68$:
                                .SBTTL  INITIALIZE RAM AND PROM ADDRESSES.
                                ;IF APT, ACT, OR XXDP, SKIP DIALOGUE AND USE DEFAULTS.
                                ;RAM = 20000, PROM = 140000, SIZE = 4K.
                                ;
002054  005737  000042                 TST     @#42            ;ACT OR XXDP ??
002060  001004                         BNE     1$              ;YES, USE DEFAULTS
002062  123727  001214  000001         CMPB    $ENV,#1         ;NO, HOW 'BOUT APT ??
002070  001044                         BNE     INIT1           ;NO, INITIALIZE VIA OPERATOR

002072  013737  001250  001420 1$:     MOV     $BASE,RAM       ;ACT, XXDP, OR APT, USE DEFAULTS
002100  013737  001250  001422         MOV     $BASE,RAMEND    ;...1ST RAM LOC = 20000
002106  062737  000776  001422         ADD     #776,RAMEND     ;...LAST RAM LOC = 020776

002114  005037  001432                 CLR     PRMX            ;CLEAR SPECIAL PROM FLAG
002120  013737  001254  001424         MOV     $CDW1,PRM       ;...1ST PROM LOC = 140000
002126  013737  001256  001430         MOV     $CDW2,PRMSZ     ;...SIZE = 4K
002134  013701  001256                 MOV     $CDW2,R1        ;...CALCULATE LAST LOC.
002140  012737  003776  001426         MOV     #3776,PRMEND    ;...IN PRMEND
002146  005301                  2$:    DEC     R1
002150  001404                         BEQ     3$
002152  062737  004000  001426         ADD     #4000,PRMEND
002160  000772                         BR      2$
002162  063737  001424  001426 3$:     ADD     PRM,PRMEND      ;LAST PROM LOC = 1ST + K.-2
002170  012737  000377  007022         MOV     #377,MAPSW      ;INH TEST 1 MAP OUTPUT.
002176  000137  002620                 JMP     RSTRT           ;GO START 'EM UP.
```

```
                                        ;INITIALIZE RAM ADDRESSES.  IF 0, USE DEFAULT ADDRESS.
                                        ;
002202                                  INIT1:
002202  104401  002210                          TYPE    ,65$            ;;TYPE ASCIZ STRING
002206  000410                                  BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <CRLF>/RAM ADDRESS = /
002230                                  64$:
002230  104413                                  RDOCT
002232  012637  001420                          MOV     (SP)+,RAM       ;;POP STACK INTO RAM
002236  001003                                  BNE     1$              ;IS IT 0 ??
002240  013737  001250  001420                  MOV     $BASE,RAM       ;YES, USE DEFAULT RAM (20000)
002246  033727  001420  000777          1$:     BIT     RAM,#777        ;256. WORD (1000 BYTE) BOUNDARY ??
002254  001013                                  BNE     2$              ;NO, COMPLAIN
002256  013701  001420                          MOV     RAM,R1          ;R1=START LOC
002262  012702  000776                          MOV     #776,R2
002266  060102                                  ADD     R1,R2           ;R2=LAST LOC
002270  010237  001422                          MOV     R2,RAMEND       ;SAVE IT
002274  004737  006662                          JSR     PC,NXM          ;TEST BOTH FOR NXM
002300  000401                                  BR      2$              ;ONE OR T'OTHER TRAPPED !!!!!
002302  000403                                  BR      INIT2           ;OK, GO INIT PROM SIZE.
                                        ;
002304  104401  013204                  2$:     TYPE    ,M1             ;SAY "INVALID ADDRESS"...
002310  000734                                  BR      INIT1           ;...AND TRY AGAIN.
                                        ;
                                        ;NOW GET THE PROM SIZE.  IF 0, DEFAULT TO 4K.
                                        ;IF X, SPECIAL 4K SET INSTALLED.  OTHERWISE ACCEPT 1-4 ONLY.
                                        ;ALSO ACCEPT 1024, 2048, 3072, OR 4096, ALTHO ACTUALLY USE
                                        ;JUST THE FIRST DIGIT.
                                        ;
002312                                  INIT2:
002312  104401  002320                          TYPE    ,65$            ;;TYPE ASCIZ STRING
002316  000407                                  BR      64$             ;;GET OVER THE ASCIZ
                                        ;;65$:  .ASCIZ  <CRLF>/PROM SIZE = /
002336                                  64$:
002336  104412                                  RDLIN
002340  012600                                  MOV     (SP)+,R0        ;POP ADDR OF 1ST CHAR.
002342  111037  001430                          MOVB    (R0),PRMSZ      ;GET THAT CHARACTER.
002346  105037  001431                          CLRB    PRMSZ+1         ;CLEAR HI BYTE.
002352  005037  001432                          CLR     PRMX            ;CLEAR SPECIAL PROM FLAG
002356  005737  001430                          TST     PRMSZ           ;SIZE = 0 (CR ONLY) ??
002362  001004                                  BNE     1$              ;NO IT'S NOT
002364  013737  001256  001430                  MOV     $CDW2,PRMSZ     ;YES, DEFAULT IS 4K.
002372  000432                                  BR      INIT3           ;GO GET START ADDRESS.
                                        ;
002374  022737  000130  001430          1$:     CMP     #'X,PRMSZ       ;SIZE = "X" ??
002402  001007                                  BNE     2$              ;NO.
002404  012737  177777  001432                  MOV     #-1,PRMX        ;YES, SET SPECIAL FLAG...
002412  012737  000004  001430                  MOV     #4,PRMSZ        ;...AND SET SIZE = 4K.
002420  000417                                  BR      INIT3           ;GO GET ADDRESS.
                                        ;
002422  162737  000060  001430          2$:     SUB     #60,PRMSZ       ;STRIP ASCII BITS
002430  100410                                  BMI     3$              ;SIZE < 0, INVALID.
002432  162737  000005  001430                  SUB     #5,PRMSZ
002440  100004                                  BPL     3$              ;SIZE > 4, INVALID.
```

```
                                                ADD     #5,PRMSZ        ;SIZE = 1, 2, 3, OR 4.
                                                BR      INIT3           ;NOW GET PROM ADDRESS

                                3$:             TYPE    ,$QUES          ;TYPE '?'
                                                BR      INIT2           ;...AND TRY AGAIN.

                                ;
                                ;NOW INITIALIZE THE PROM ADDRESSES.  IF 0, USE DEFAULT.
                                ;
                                INIT3:
                                                TYPE    ,65$            ;;TYPE ASCIZ STRING
                                                BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:          .ASCIZ  <CRLF>/PROM ADDRESS = /
                                64$:
                                                RDOCT
                                                MOV     (SP)+,PRM       ;;POP STACK INTO PRM
                                                BNE     1$              ;IS IT 0 ??
                                                MOV     $CDW1,PRM       ;YES, USE DEFAULT PROM (140000).
                                1$:             BIT     #3777,PRM       ;ON 1K WORD (4000 BYTE) BOUNDARY ??
                                                BNE     4$              ;NO, COMPLAIN.

                                                MOV     PRM,R1          ;YES, SET UP FOR NXM CHECK.
                                                MOV     #3776,R2        ;DETERMINE LAST ADDRESS...
                                                MOV     PRMSZ,R3        ;...BASED ON PROM SIZE.
                                2$:             DEC     R3
                                                BEQ     3$              ;R2 = SIZE-2
                                                ADD     #4000,R2
                                                BR      2$

                                3$:             ADD     R1,R2           ;R2 = LAST PROM ADDRESS.
                                                MOV     R2,PRMEND       ;SAVE IT.
                                                JSR     PC,NXM          ;CHECK BOTH ADDRESSES.
                                                BR      4$              ;ONE OF THEM TRAPPED !!!!
                                                CLR     MAPSW           ;ENABLE TEST 1 MAP OUTPUT.
                                                JMP     RSTRT           ;OK, GO START TESTING.

                                4$:             TYPE    ,M2             ;SAY "INVALID PROM RANGE ETC"
                                                JMP     INIT2           ;...AND TRY AGAIN.
```

```
1025  002620  005037  001202          RSTRT:  CLR     $PASS           ;CLEAR PASS COUNTER
1026  002624  012706  001100          AGAIN:  MOV     #STACK,SP       ;INIT THE SP. (LOOP HERE ON EOP)
1027                                  ;;#####################################################################
1028                                  ;#TEST 1        BUILD AND TEST A 32K MEMORY MAP.
1029                                  ;;#####################################################################
1030  002630  000240                  TST1:   NOP
1031  002632  012737  000100  001160          MOV     #100.,$TIMES    ;;DO 100 ITERATIONS
1032  002640  112737  000001  001102          MOVB    #1,$TSTNM       ;INIT TEST NUMBER
1033  002646  012737  000001  001200          MOV     #1,$TESTN       ;APT TOO
1034                                          .ENABL  LSB
1035  002654  012737  003146  001106          MOV     #7$,SLPADR      ;SET LOOP ADDRESS
1036  002662  013737  001106  001110          MOV     SLPADR,SLPERR   ;AND ERROR LOOPER.
1037                                  ;
1038                                  ;ENTER AT TST1A FROM "MDUMP" START. DUMP THE MAP AND RETURN.
1039                                  ;
1040  002670  005037  007020          TST1A:  CLR     LOC             ;START AT LOCATION 0 (0-4K).
1041  002674  012737  000020  007016          MOV     #16.,MAPK       ;INIT SEGMENT COUNT
1042  002702  012737  007024  007012          MOV     #MEMMAP,RMAP    ;...R MAP POINTER...
1043  002710  012737  007026  007014          MOV     #MEMMAP+2,WMAP  ;...AND W MAP POINTER.
1044
1045  002716  105737  007022                  TSTB    MAPSW           ;LO BYTE INHIBITS OUTPUT IF AUTO
1046  002722  001004                          BNE     1$
1047  002724  104401  001171                  TYPE    ,$CRLF          ;DOUBLE CRLF.
1048  002730  104401  001171                  TYPE    ,$CRLF
1049  002734  017700  004060          1$:     MOV     @LOC,R0         ;READ..., AND IF NO-TRAP...
1050  002740  010077  004054          RD1:    MOV     R0,@LOC         ;...WRITE, AND IF NO-TRAP...
1051  002744  000261                  WRT1:   SEC                     ;...YOU'RE HERE. "LOC" IS R/W.
1052  002746  006177  004040                  ROL     @RMAP           ;SET BIT IN READ MAP...
1053  002752  000261                          SEC
1054  002754  006177  004034                  ROL     @WMAP           ;...AND IN WRITE MAP.
1055  002760  105737  007022                  TSTB    MAPSW
1056  002764  001032                          BNE     2$
1057  002766  104401  015120                  TYPE    ,W              ;W = READ/WRITE SEGMENT.
1058  002772  000427                          BR      2$
1059
1060  002774  000241          RTN1:   CLC                             ;YOU'RE HERE IF "LOC" WAS NEXM.
1061  002776  006177  004010                  ROL     @RMAP           ;CLEAR BIT IN READ MAP...
1062  003002  000241                          CLC
1063  003004  006177  004004                  ROL     @WMAP           ;...AND WRITE MAP.
1064  003010  105737  007022                  TSTB    MAPSW
1065  003014  001016                          BNE     2$
1066  003016  104401  015114                  TYPE    ,DASH           ;DASH = NEXM SEGMENT.
1067  003022  000413                          BR      2$
1068
1069  003024  000261          RTN2:   SEC                             ;YOU'RE HERE IF "LOC" WAS READ ONLY.
1070  003026  006177  003760                  ROL     @RMAP           ;SET BIT IN READ MAP...
1071  003032  000241                          CLC
1072  003034  006177  003754                  ROL     @WMAP           ;CLEAR IT IN WRITE MAP.
1073  003040  105737  007022                  TSTB    MAPSW
1074  003044  001002                          BNE     2$
1075  003046  104401  015116                  TYPE    ,R              ;R = READ ONLY SEGMENT.
```

```
1076  003052  005337  007016          2$:   DEC   MAPK             ;BUMP SEGMENT COUNT
1077  003056  001016                        BNE   3$               ;BR IF 4K (16BITS) NOT DONE YET.
1078  003060  012737  000020  007016        MOV   #16.,MAPK        ;INIT COUNT FOR NEXT BANK
1079  003066  062737  000004  007012        ADD   #4,RMAP          ;BUMP MAP POINTERS
1080  003074  062737  000004  007014        ADD   #4,WMAP
1081
1082  003102  105737  007022                TSTB  MAPSW
1083  003106  001002                        BNE   3$
1084  003110  104401  001171                TYPE  ,$CRLF           ;CRLF IF NOT INHIBITED
1085  003114  062737  001000  007020  3$:   ADD   #1000,LOC        ;INIT POINTER FOR NEXT SEGMENT
1086  003122  001304                        BNE   1$               ;CONTINUE...
1087                                                               ;..."LOC" WILL BE 0 AT 32K.
1088  003124  105737  007022                TSTB  MAPSW
1089  003130  001006                        BNE   7$
1090  003132  104401  001171                TYPE  ,$CRLF           ;FINAL CRLF IF NOT INHIBITED.
1091                                  ;
1092                                  ;NOW, ON INITIAL PASS, COPY MEMMAP TO SAVMAP.  ON SUBSEQUENT
1093                                  ;PASSES, COMPARE REFERENCE (SAVMAP) TO CURRENT (MEMMAP)
1094                                  ;AND REPORT ANY DISCREPANCIES.
1095                                  ;IF ENTRY WAS FROM "MDUMP" START, RETURN THERE WITHOUT
1096                                  ;ANY FURTHER ACTION.
1097                                  ;
1098  003136  005737  001434                TST   MAINT            ;MAINT FLAG SET ??
1099  003142  001401                        BEQ   .+4              ;NO
1100  003144  000207                        RTS   PC               ;YES, RETURN TO "MDUMP".
1101
1102  003146  005000          7$:   CLR     R0                     ;INIT MAP INDEX
1103  003150  105737  007023                TSTB  MAPSW+1          ;HI BYTE = 0, ON INIT PASS.
1104  003154  001013                        BNE   5$               ;NO, COMPARE THIS MAP WITH REF.
1105  003156  016060  007024  007064  4$:   MOV   MEMMAP(R0),SAVMAP(R0) ;YES, SAVE THE REF MAP.
1106  003164  005720                        TST   (R0)+
1107  003166  022700  000034                CMP   #28.,R0          ;DONE ??
1108  003172  001371                        BNE   4$               ;NO
1109  003174  012737  177777  007022        MOV   #-1,MAPSW        ;YES, SET SWITCH TO INH OUTPUT...
1110  003202  000632                        BR    TST1A            ;...AND COMPARE FROM NOW ON.
1111
1112  003204  026060  007024  007064  5$:   CMP   MEMMAP(R0),SAVMAP(R0) ;COMPARE MAPS.
1113  003212  001005                        BNE   10$              ;ERROR
1114  003214  005720          6$:   TST     (R0)+                  ;CONTINUE AFTER ERROR
1115  003216  022700  000034                CMP   #28.,R0          ;DONE ??
1116  003222  001370                        BNE   5$               ;NOT YET
1117  003224  000456                        BR    TST2             ;;DONE, GO NEXT TEST.
```

```
                                        ;;*****************************************************************
                                        ;MAP ERROR.  RE-CONSTRUCT AND OUTPUT A MAP FOR THE FAILING
                                        ;BANK.  CONTINUE AFTER OUTPUT.
                                        ;
003226 010001                   10$:    MOV     R0,R1           ;INDEX/2 + 1 = BANK NUMBER
003230 006201                           ASR     R1
003232 006201                           ASR     R1
003234 062701 000061                    ADD     #61,R1          ;R1 = ASCII BANK #.
003240 110137 015064                    MOVB    R1,EM14A        ;SET # IN ERROR MSG STRING.

003244 032700 000002                    BIT     #BIT1,R0        ;ADJUST INDEX TO PICK 1ST WORD OF PAIR.
003250 001401                           BEQ     .+4             ;NO ADJ REQ'D.
003252 005740                           TST     -(R0)           ;DEC INDEX
003254 016037 007024 001122             MOV     MEMMAP(R0),SBDADR ;FAILING R WORD
003262 005720                           TST     (R0)+           ;BUMP INDEX
003264 016037 007024 001126             MOV     MEMMAP(R0),SBDDAT ;FAILING W WORD

003272 005001                           CLR     R1              ;INIT BIT COUNTER
003274 005737 001122            11$:    TST     SBDADR
003300 100007                           BPL     12$             ;IF R BIT = 0, NEXM.
003302 005737 001126                    TST     SBDDAT          ;IF R BIT = 1...
003306 100010                           BPL     13$             ;...AND W = 0, READ ONLY.
                                                                ;IF BOTH = 1, READ/WRITE.
003310 112761 000127 015067             MOVB    #'W,EM14B(R1)   ;SET APPROPRIATE CHARACTER...
003316 000407                           BR      14$
003320 112761 000055 015067     12$:    MOVB    #'-,EM14B(R1)   ;...IN ERROR MAP...
003326 000403                           BR      14$
003330 112761 000122 015067     13$:    MOVB    #'R,EM14B(R1)   ;...CHARACTER STRING.

003336 006137 001122            14$:    ROL     SBDADR          ;NOW ROTATE TO NEXT BIT
003342 006137 001126                    ROL     SBDDAT
003346 005201                           INC     R1              ;BUMP BIT COUNT (INDEX)
003350 022701 000020                    CMP     #16.,R1
003354 001347                           BNE     11$             ;CONTINUE FOR 16 BITS.
003356 104014                           ERROR   14              ;PRINT ERROR "ITEM 14"...
003360 000715                           BR      6$              ;...AND CONTINUE TEST.
                                        ;;*****************************************************************
                                                .DSABL  LSB
```

```
                        ;;*****************************************************************
                        ;*TEST 2         RAM -- BASIC 1'S AND 0'S TEST.
                        ;;*****************************************************************
003362  000004          TST2:   SCOPE
003364  012737  000100  001160          MOV     #100,STIMES     ;;DO 100 ITERATIONS
003372  005037  003416                  CLR     PATRN           ;FIRST PATTERN IS ZEROS
003376  004737  003420                  JSR     PC,DATTST       ;RUN IT...
003402  012737  177777  003416          MOV     #-1,PATRN       ;NEXT PATTERN IS ONES.
003410  004737  003420                  JSR     PC,DATTST       ;DO IT...
003414  000453                          BR      TST3            ;;SKIP OVER SUBRTN TO NEXT TEST.
                        ;
                        ;SUBROUTINE FOR 1'S AND 0'S TEST.
                        ;
003416  000000          PATRN:  0
003420  012701  000400  DATTST: MOV     #256.,R1        ;WORD COUNT
003424  013702  001420          MOV     RAM,R2          ;FIRST ADDRESS
003430  013722  003416  1$:     MOV     PATRN,(R2)+     ;FILL THE RAM.
003434  005301                  DEC     R1
003436  001374                  BNE     1$              ;CONTINUE TIL DONE.
003440  012701  000400          MOV     #256.,R1        ;OK, RESET COUNT.
003444  012737  003532  001110  MOV     #44$,$LPERR     ;SET FOR SWR9 OPTION IN 'ERROR'
003452  013702  001420          MOV     RAM,R2          ;SET FIRST ADDRESS.
003456  023722  003416  2$:     CMP     PATRN,(R2)+     ;DATA OK ??
003462  001006                  BNE     4$              ;NO, DATA ERROR.
003464  005301  3$:     DEC     R1              ;YES.
003466  001373                  BNE     2$              ;CONTINUE TIL DONE
003470  013737  001106  001110  MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
003476  000207                  RTS     PC              ;RETURN TO CALLER
                        ;;*****************************************************************
003500  013737  003416  001124  4$:     MOV     PATRN,$GDDAT    ;GOOD DATA.
003506  016237  177776  001126          MOV     -2(R2),$BDDAT   ;BAD DATA
003514  010237  001122                  MOV     R2,$BDADR
003520  062737  177776  001122          ADD     #-2,$BDADR      ;BAD ADDRESS
003526  104001                          ERROR   1               ;PRINT ERROR "ITEM 1".
003530  000755                          BR      3$              ;CONTINUE AFTER ERROR. (SWR9=0)
003532  062702  177776  44$:    ADD     #-2,R2          ;LOOP ON THIS ERROR (SWR9=1)
003536  013712  003416          MOV     PATRN,(R2)      ;REFRESH FAILED LOCATION...
003542  000745                  BR      2$              ;...AND TRY AGAIN.
                        ;;*****************************************************************
```

```
1200                                    ;;*****************************************************************
1201                                    ;*TEST 3        RAM -- BASIC ADDRESS TEST.
1202                                    ;;*****************************************************************
1203  003544  000004                    TST3:   SCOPE
1204  003546  012737  000100  001160            MOV     #100,STIMES     ;;DO 100 ITERATIONS
1205  003554  012701  000400                    MOV     #256.,R1        ;WORD COUNT
1206  003560  013702  001420                    MOV     RAM,R2          ;FIRST ADDRESS
1207  003564  010212                    1$:     MOV     R2,(R2)         ;FILL WITH OWN ADDRESS.
1208  003566  005722                            TST     (R2)+           ;BUMP ADDRESS POINTER
1209  003570  005301                            DEC     R1              ;DONE YET ??
1210  003572  001374                            BNE     1$              ;NO, CONTINUE FILLING.
1211
1212  003574  012737  003654  001110            MOV     #44$,SLPERR     ;SET FOR SWR9 OPTION IN 'ERROR'
1213  003602  012701  000400                    MOV     #256.,R1        ;RESET COUNT
1214  003606  013702  001420                    MOV     RAM,R2          ;..AND ADDRESS.
1215  003612  020212                    2$:     CMP     R2,(R2)         ;COMPARE EACH ADDRESS.
1216  003614  001007                            BNE     4$              ;ADDRESS ERROR
1217  003616  005722                    3$:     TST     (R2)+           ;BUMP ADDRESS
1218  003620  005301                            DEC     R1
1219  003622  001373                            BNE     2$              ;AND CONTINUE TIL DONE
1220
1221  003624  013737  001106  001110            MOV     $LPADR,SLPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
1222  003632  000412                            BR      TST4            ;;DONE, GO TO NEXT TEST.
1223
1224                                    ;;*****************************************************************
1225  003634  010237  001122            4$:     MOV     R2,$BOADR       ;BAD ADDRESS
1226  003640  010237  001124                    MOV     R2,$GDDAT       ;GOOD DATA
1227  003644  011237  001126                    MOV     (R2),$BDDAT     ;BAD DATA
1228  003650  104002                            ERROR   2               ;PRINT ERROR "ITEM 2".
1229  003652  000761                            BR      3$              ;CONTINUE AFTER ERROR. (SWR9=0)
1230                                                                    ;... OR ...
1231  003654  010212                    44$:    MOV     R2,(R2)         ;RETRY ON THIS ERROR (SWR9=1)
1232  003656  000755                            BR      2$
1233                                    ;;*****************************************************************
```

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1234                                    ;;*****************************************************************
1235                                    ;#TEST 4        RAM -- FAST READ TEST.
1236                                    ;;*****************************************************************
1237  003660  000004                    TST4:   SCOPE
1238  003662  012737  000100  001160            MOV     #100,STIMES     ;;DO 100 ITERATIONS
1239  003670  013701  001420            1$:     MOV     RAM,R1          ;RAM START LOC.
1240  003674  012702  015122                    MOV     #IBUF,R2        ;INTERNAL BUFFER ADDRESS
1241  003700  013703  001422                    MOV     RAMEND,R3
1242  003704  062703  000002                    ADD     #2,R3           ;END OF RAM +2.
1243
1244  003710  012122                    2$:     MOV     (R1)+,(R2)+     ;FILL THE BUFFER WITH 256
1245                                                                    ;CONSECUTIVE READS.
1246                                    ;
1247                                    ;THE MOV INSTR ABOVE IS REPEATED 255 TIMES.
1248                                    ;LISTING TURNED OFF FOR ALL THAT.
1249                                    ;
1250                                    ;
1251                                    ;NOW THE INTERNAL BUFFER IS A RAM IMAGE.
1252                                    ;
1253  004710  013701  001420                    MOV     RAM,R1          ;RESET POINTERS...
1254  004714  012702  015122                    MOV     #IBUF,R2
1255  004720  022122                    1$:     CMP     (R1)+,(R2)+     ;...AND COMPARE EACH ADDRESS
1256  004722  001003                            BNE     2$              ;ADDRESS ERROR.
1257
1258  004724  020103                    3$:     CMP     R1,R3           ;DONE YET ??
1259  004726  001374                            BNE     1$              ;NOPE, CONTINUE CHECKING.
1260  004730  000415                            BR      TST5            ;;YES, GO TO NEXT TEST.
1261
1262                                    ;;*****************************************************************
1263  004732  016137  177776  001122  2$:     MOV     -2(R1),$BDADR   ;RAM WORD
1264  004740  016237  177776  001126            MOV     -2(R2),$BDDAT   ;BUFFER WORD
1265  004746  010137  001120                    MOV     R1,$GDADR
1266  004752  062737  177776  001120            ADD     #-2,$GDADR      ;RAM ADDRESS (=GOOD DATA).
1267  004760  104003                            ERROR   3               ;PRINT ERROR "ITEM 3".
1268  004762  000760                            BR      3$              ;CONTINUE AFTER ERROR (SWR9=0)
1269                                                                    ;...OR RESTART AT 'TST3+2'  (SWR9=1)
1270                                    ;;*****************************************************************
```

```
1271                                    ;;*****************************************************************
1272                                    ;*TEST 5        RAM -- SLIDING 0 BIT TEST.
1273                                    ;;*****************************************************************
1274 004764 000004                     TST5:   SCOPE
1275 004766 012737 000100 001160               MOV     #100,$TIMES     ;;DO 100 ITERATIONS
1276 004774 012737 177777 005060               MOV     #-1,FILLR       ;BACKGROUND = 1'S
1277 005002 012737 177776 005062               MOV     #-2,SLIDR       ;SLIDE A 0 BIT.
1278 005010 004737 005064                      JSR     PC,SLIDE        ;GO DO IT.
1279 005014 013737 001106 001110               MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
1280
1281                                    ;;*****************************************************************
1282                                    ;*TEST 6        RAM -- SLIDING 1 BIT TEST.
1283                                    ;;*****************************************************************
1284 005022 000004                     TST6:   SCOPE
1285 005024 012737 000100 001160               MOV     #100,$TIMES     ;;DO 100 ITERATIONS
1286 005032 005037 005060                      CLR     FILLR           ;BACKGROUND = 0'S
1287 005036 012737 000001 005062               MOV     #1,SLIDR        ;SLIDE A 1 BIT.
1288 005044 004737 005064                      JSR     PC,SLIDE        ;GO DO IT.
1289 005050 013737 001106 001110               MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
1290 005056 000544                             BR      TST7            ;;DONE, SKIP OVER SUBRTNS TO NEXT TEST.
1291                                    ;
1292                                    ;SUBROUTINE FOR SLIDING BIT TESTS.
1293                                    ;
1294 005060 000000                     FILLR:  0                       ;PATTERN FOR FILLER.
1295 005062 000000                     SLIDR:  0                       ;BIT TO SLIDE.
1296 005064 013702 001420              SLIDE:  MOV     RAM,R2          ;FIRST LOC.
1297 005070 013703 001422                      MOV     RAMEND,R3
1298 005074 062703 000002                      ADD     #2,R3           ;LAST LOC +2.
1299 005100 013722 005060              1$:     MOV     FILLR,(R2)+     ;FILL WITH BACKGROUND
1300 005104 020203                             CMP     R2,R3           ;DONE YET ??
1301 005106 001374                             BNE     1$              ;NO.
1302
1303 005110 012737 005360 001110               MOV     #40$,$LPERR     ;SET FOR SWR9 OPTION IN 'ERROR'
1304 005116 013702 001420                      MOV     RAM,R2          ;RESET 1ST LOC.
1305 005122 062703 177776                      ADD     #-2,R3          ;R3 = LAST LOC.
1306 005126 013701 005062                      MOV     SLIDR,R1        ;R1 = SLIDING BIT WORD
1307 005132 010112                     2$:     MOV     R1,(R2)         ;TEST 1ST (NEXT) LOC.
1308 005134 020112                             CMP     R1,(R2)         ;IS PATTERN RIGHT ??
1309 005136 001036                             BNE     10$             ;NO, PATTERN ERROR.
1310
1311 005140 020237 001420              11$:    CMP     R2,RAM          ;IS THIS THE 1ST LOC ??
1312 005144 001404                             BEQ     21$             ;YES, DONT CHECK LOC-2.
1313 005146 023762 005060 177776               CMP     FILLR,-2(R2)    ;IS LOC-2 UNDISTURBED ??
1314 005154 001037                             BNE     20$             ;NO, ERROR
1315
1316 005156 020203                     21$:    CMP     R2,R3           ;IS THIS LAST LOC ??
1317 005160 001424                             BEQ     6$              ;YES, YOURE ALL DONE.
1318
1319 005162 023762 005060 000002               CMP     FILLR,2(R2)     ;IS LOC+2 UNDISTURBED ??
1320 005170 001052                             BNE     30$             ;NO, ERROR.
1321
1322 005172 005737 005062              31$:    TST     SLIDR           ;CLEAR 'C', SLIDING 0 OR 1 ??
1323 005176 100403                             BMI     4$              ; 0, SKIP NEXT 3.
1324 005200 006101                             ROL     R1              ;SLIDE THE 1 LEFT 1.
```

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1325  005202  103353                  BCC     2$              ;LOOP FOR 16 BITS.
1326  005204  000403                  BR      5$              ;OK, NOW SET FOR NEXT LOC.
1327  005206  000261          4$:     SEC                     ;SET 'C'.
1328  005210  006101                  ROL     R1              ;SLIDE THE 0 LEFT 1.
1329  005212  103747                  BCS     2$              ;LOOP FOR 16 BITS.
1330
1331  005214  013712  005060  5$:     MOV     FILLR,(R2)      ;RESET BACKGROUND PATTERN.
1332  005220  062702  000002          ADD     #2,R2           ;BUMP ADDRESS POINTER.
1333  005224  013701  005062          MOV     SLIDR,R1        ;RESET SLIDE WORD.
1334  005230  000740                  BR      2$              ;...AND DO IT ALL AGAIN.
1335
1336  005232  000207          6$:     RTS     PC              ;EXIT TO CALLER.
1337
1338                          ;;**************************************************************
1339                          ;IF THE PATTERN IS STORED WRONG, OR IF AN ADJACENT LOCATION
1340                          ;WAS ALTERED, REPORT THAT FACT.
1341                          ;
1342  005234  010137  001124  10$:     MOV     R1,$GDDAT       ;GOOD DATA
1343  005240  010237  001122          MOV     R2,$BDADR       ;FAILING ADDRESS
1344  005244  011237  001126          MOV     (R2),$BDDAT     ;BAD DATA
1345  005250  104001                  ERROR   1               ;PRINT ERROR "ITEM 1".
1346  005252  000732                  BR      11$             ;CONTINUE AFTER ERROR. (SWR9=0)
1347                                                          ;...OR RETRY AT 40$ (SWR9=1)
1348
1349  005254  010237  001120  20$:     MOV     R2,$GDADR       ;BASE LOC
1350  005260  011237  001124          MOV     (R2),$GDDAT     ;...CONTENTS = SLIDE PATTERN
1351  005264  010237  001122          MOV     R2,$BDADR
1352  005270  062737  177776  001122  ADD     #-2,$BDADR      ;FAILING ADDR = LOC-2
1353  005276  016237  177776  001126  MOV     -2(R2),$BDDAT   ;...CONTENTS = BAD DATA
1354  005304  104004                  ERROR   4               ;PRINT ERROR "ITEM 4".
1355  005306  013762  005060  177776  MOV     FILLR,-2(R2)    ;REFRESH FAILED LOCATION
1356  005314  000720                  BR      21$             ;CONTINUE AFTER ERROR. (SWR9=0)
1357                                                          ;...OR RETRY AT 40$ (SWR9=1)
1358
1359  005316  010237  001120  30$:     MOV     R2,$GDADR       ;SAME AS ABOVE..
1360  005322  011237  001124          MOV     (R2),$GDDAT
1361  005326  010237  001122          MOV     R2,$BDADR
1362  005332  062737  000002  001122  ADD     #2,$BDADR       ;FAILING ADDR = LOC+2
1363  005340  016237  000002  001126  MOV     2(R2),$BDDAT
1364  005346  104005                  ERROR   5               ;PRINT ERROR "ITEM 5".
1365  005350  013762  005060  000002  MOV     FILLR,2(R2)     ;REFRESH FAILED LOCATION
1366  005356  000705                  BR      31$             ;CONTINUE AFTER ERROR. (SWR9=0)
1367                                                          ;...OR...
1368  005360  013777  005060  173534  40$:     MOV     FILLR,@$BDADR   ;REFRESH FAILED LOCATION...
1369  005366  000661                  BR      2$              ;...AND RETRY (SWR9=1)
1370                          ;;**************************************************************
```

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1371                                    ;;*****************************************************************
1372                                    ;*TEST 7        RAM -- ALTERNATE BIT PATTERN TEST.
1373                                    ;;*****************************************************************
1374  005370  000004                    TST7:   SCOPE
1375  005372  012737  000100  001160            MOV     #100,$TIMES     ;;DO 100 ITERATIONS
1376  005400  013702  001420                    MOV     RAM,R2          ;1ST LOC
1377  005404  013703  001422                    MOV     RAMEND,R3
1378  005410  062703  000002                    ADD     #2,R3           ;LAST LOC +2
1379  005414  012701  052525                    MOV     #52525,R1       ;INITIAL R1 = 052525
1380
1381  005420  010122                    1$:     MOV     R1,(R2)+        ;STORE A WORD.
1382  005422  005101                            COM     R1              ;COMPLIMENT IT
1383  005424  020203                            CMP     R2,R3           ;DONE ALL ??
1384  005426  001374                            BNE     1$              ;NO, STORE COMP IN NEXT LOC.
1385
1386  005430  012737  005532  001110            MOV     #30$,$LPERR     ;SET FOR SWR9 OPTION IN 'ERROR'
1387  005436  013702  001420                    MOV     RAM,R2          ;NOW COMPARE THEM.
1388  005442  020122                    2$:     CMP     R1,(R2)+        ;PATTERN RIGHT ??
1389  005444  001016                            BNE     3$              ;NO, PATTERN ERROR
1390
1391  005446  005101                    4$:     COM     R1              ;COMP PATTERN
1392  005450  020203                            CMP     R2,R3           ;COMPARED ALL ??
1393  005452  001373                            BNE     2$              ;NO, COMPARE NEXT
1394                                    ;
1395                                    ;AT THIS POINT 052525,125252,052525,125252, ETC HAS BEEN DONE.
1396                                    ;       NOW USE 125252,052525,125252, ETC.
1397                                    ;
1398  005454  013702  001420                    MOV     RAM,R2          ;RESET START LOC.
1399  005460  022701  052525                    CMP     #52525,R1       ;IS THIS 1ST PASS ??
1400  005464  001002                            BNE     5$              ;NO, YOU'RE ALL DONE
1401  005466  005101                            COM     R1              ;YES, SET UP FOR 2ND PASS.
1402  005470  000753                            BR      1$              ;...AND DO IT.
1403
1404  005472  013737  001106  001110  5$:       MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
1405  005500  000416                            BR      TST10           ;;...AND GO TO NEXT TEST.
1406
1407                                    ;;*****************************************************************
1408  005502  016237  177776  001126  3$:       MOV     -2(R2),$BDDAT   ;BAD DATA
1409  005510  010237  001120                    MOV     R2,$GDADR
1410  005514  062737  177776  001120            ADD     #-2,$GDADR      ;FAILING ADDRESS.
1411  005522  010137  001124                    MOV     R1,$GDDAT       ;GOOD DATA
1412  005526  104006                            ERROR   6               ;PRINT ERROR "ITEM 6".
1413  005530  000746                            BR      4$              ;CONTINUE AFTER ERROR. (SWR9=0)
1414                                                                    ;... OR ...
1415  005532  010142                    30$:    MOV     R1,-(R2)        ;REFRESH FAILED LOCATION...
1416  005534  000742                            BR      2$              ;...AND RETRY (SWR9=1)
1417                                    ;;*****************************************************************
```

```
1418                                    ;;*****************************************************************
1419                                    ;#TEST 10       RAM -- WRITE BYTE TEST.
1420                                    ;;*****************************************************************
1421  005536  000004                    TST10:  SCOPE
1422  005540  012737  000100  001160            MOV     #100,$TIMES     ;;DO 100 ITERATIONS
1423  005546  005037  005640                    CLR     BKG             ;BACKGROUND PATTERN = 0.
1424  005552  005001                            CLR     R1              ;BYTE INDEX = 0.
1425  005554  012737  000377  005634            MOV     #377,PTRN       ;TEST PATTERN = 0,-1
1426  005562  004737  005642                    JSR     PC,BYTTST       ;FILL WITH ZEROS, WRITE LO...
1427                                                                    ;...BYTE -1, AND TEST WORD.
1428  005566  012701  000001                    MOV     #1,R1           ;BYTE INDEX = 1.
1429  005572  005137  005634                    COM     PTRN            ;TEST PATTERN = -1,0
1430  005576  004737  005642                    JSR     PC,BYTTST       ;FILL WITH ZEROS, WRITE HI...
1431                                                                    ;...BYTE -1, AND TEST WORD.
1432  005602  012737  177777  005640            MOV     #-1,BKG         ;BACKGROUND PATTERN = -1.
1433  005610  005001                            CLR     R1              ;BYTE INDEX = 0.
1434  005612  004737  005642                    JSR     PC,BYTTST       ;FILL WITH 1'S, WRITE LO...
1435                                                                    ;...BYTE 0, AND TEST WORD.
1436  005616  012701  000001                    MOV     #1,R1           ;BYTE INDEX = 1
1437  005622  005137  005634                    COM     PTRN            ;TEST PATTERN = 0,-1
1438  005626  004737  005642                    JSR     PC,BYTTST       ;FILL WITH 1'S, WRITE HI...
1439                                                                    ;...BYTE 0, AND TEST WORD.
1440  005632  000475                            BR      TST11           ;;DONE, GO TO NEXT TEST.
1441                                    ;
1442                                    ;SUBROUTINE FOR RAM BYTE TEST.
1443                                    ;
1444  005634  000000                    PTRN:   0                       ;0,-1 OR -1,0
1445  005636  000000                    WORDX:  0                       ;WORD ADDRESS.
1446  005640  000000                    BKG:    0                       ;BACKGROUND PATTERN
1447  005642  013702  001420            BYTTST: MOV     RAM,R2          ;INIT RAM ADDRESS
1448  005646  012703  000400                    MOV     #400,R3         ;...AND WORD COUNT.
1449  005652  013722  005640            1$:     MOV     BKG,(R2)+       ;FILL RAM WITH BACKGROUND.
1450  005656  005303                            DEC     R3
1451  005660  001374                            BNE     1$
1452
1453  005662  012737  006016  001110            MOV     #11$,$LPERR     ;SET FOR SWR9 OPTION IN 'ERROR'
1454  005670  013737  001420  005636            MOV     RAM,WORDX       ;SET WORD ADDRESS...
1455  005676  063701  005636                    ADD     WORDX,R1        ;...AND BYTE ADDRESS (R1).
1456  005702  012703  000400                    MOV     #400,R3
1457  005706  005737  005640            4$:     TST     BKG             ;BACKGROUND = 0 ??
1458  005712  001003                            BNE     2$              ;NO, WRITE A 0 BYTE.
1459  005714  112711  177777                    MOVB    #-1,(R1)        ;YES, WRITE A -1 BYTE...
1460  005720  000401                            BR      3$              ;...AND SKIP NEXT INSTR.
1461  005722  105011                    2$:     CLRB    (R1)            ;WRITE A 0 BYTE
1462
1463  005724  000240                    3$:     NOP
1464  005726  023777  005634  177702            CMP     PTRN,@WORDX     ;PATTERN RIGHT IN RAM ??
1465  005734  001013                            BNE     10$             ;NO, ERROR.
1466  005736  062737  000002  005636  5$:     ADD     #2,WORDX        ;YES, BUMP ADDRESS POINTERS.
1467  005744  062701  000002                    ADD     #2,R1
1468  005750  005303                            DEC     R3
1469  005752  001355                            BNE     4$              ;CONTINUE
1470  005754  013737  001106  001110            MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
1471  005762  000207                            RTS     PC              ;...AND EXIT.
```

```
1472
1473                                    ;;*****************************************************************
1474  005764  013737  005636  001120  10$:    MOV     WORDX,$GDADR    ;FAILING WORD ADDRESS
1475  005772  017737  177640  001126          MOV     @WORDX,$BDDAT   ;BAD DATA WORD.
1476  006000  010137  001122                  MOV     R1,$BDADR       ;BYTE WRITTEN ADDRESS
1477  006004  013737  005634  001124          MOV     PTRN,$GDDAT     ;GOOD DATA PATTERN
1478  006012  104007                          ERROR   7               ;PRINT ERROR "ITEM 7".
1479  006014  000750                          BR      5$              ;CONTINUE AFTER ERROR (SWR9=0)
1480                                                                  ;... OR ...
1481  006016  013777  005640  177612  11$:    MOV     BKG,@WORDX      ;REFRESH FAILED LOC...
1482  006024  000730                          BR      4$              ;...AND RETRY (SWR9=1)
1483                                    ;;*****************************************************************
```

```
1484                                    ;;*****************************************************************
1485                                    ;*TEST 11       PROM -- PROM TO RAM COPY TEST.
1486                                    ;;*****************************************************************
1487  006026  000004                    TST11:  SCOPE
1488  006030  012737  000100  001160            MOV     #100,$TIMES     ;;DO 100 ITERATIONS
1489  006036  013701  001424            1$:     MOV     PRM,R1          ;INIT PROM ADDRESS
1490  006042  013702  001420                    MOV     RAM,R2          ;...AND RAM ADDRESS
1491  006046  012703  000400                    MOV     #400,R3         ;... WORD COUNT
1492  006052  010304                            MOV     R3,R4           ;... DITTO
1493  006054  012737  006206  001110            MOV     #12$,$LPERR     ;SET FOR SWR9 OPTION IN 'ERROR'
1494
1495  006062  020102                    1$:     CMP     R1,R2           ;IF RAM IS WITHIN PROM SPACE...
1496  006064  001002                            BNE     5$
1497  006066  062701  001000                    ADD     #512.,R1        ;...SKIP 256 PROM LOCATIONS.
1498
1499  006072  012122                    5$:     MOV     (R1)+,(R2)+     ;COPY PROM TO RAM
1500  006074  005303                            DEC     R3
1501  006076  001371                            BNE     1$
1502
1503  006100  162701  001000                    SUB     #1000,R1        ;RESET PROM ADDRESS
1504  006104  013702  001420                    MOV     RAM,R2          ;AND RAM ADDRESS
1505  006110  021112                    2$:     CMP     (R1),(R2)       ;COMPARE PROM-RAM
1506  006112  001023                            BNE     10$             ;ERROR !!!
1507  006114  005304                    11$:    DEC     R4              ;256 WORDS DONE ??
1508  006116  001403                            BEQ     3$              ;YES
1509  006120  005721                            TST     (R1)+           ;NO, BUMP POINTERS...
1510  006122  005722                            TST     (R2)+
1511  006124  000771                            BR      2$              ;...AND CONTINUE
1512
1513  006126  020137  001426            3$:     CMP     R1,PRMEND       ;END OF PROM ??
1514  006132  001407                            BEQ     4$              ;YES
1515  006134  005721                            TST     (R1)+           ;NO, BUMP PROM ADRESS
1516  006136  013702  001420                    MOV     RAM,R2          ;INIT RAM ADDRESS...
1517  006142  012703  000400                    MOV     #400,R3         ;...AND COUNTERS
1518  006146  010304                            MOV     R3,R4
1519  006150  000744                            BR      1$              ;AND DO THE NEXT CHUNK.
1520
1521  006152  013737  001106  001110    4$:     MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
1522  006160  000414                            BR      TST12           ;;...AND GO TO NEXT TEST.
1523
1524                                    ;;*****************************************************************
1525  006162  010137  001120            10$:    MOV     R1,$GDADR       ;PROM ADDRESS
1526  006166  011137  001124                    MOV     (R1),$GDDAT     ;PROM DATA
1527  006172  010237  001122                    MOV     R2,$BDADR       ;RAM ADDRESS
1528  006176  011237  001126                    MOV     (R2),$BDDAT     ;RAM DATA
1529  006202  104011                            ERROR   11              ;PRINT ERROR "ITEM 11".
1530  006204  000743                            BR      11$             ;CONTINUE AFTER ERROR (SWR9=0)
1531                                                                    ;... OR ...
1532  006206  011112            12$:    MOV     (R1),(R2)       ;REFRESH FAILED RAM LOC...
1533  006210  000737                            BR      2$              ;...AND RETRY (SWR9=1)
1534                                    ;;*****************************************************************
```

```
                                        ;;#################################################################
                                        ;#TEST 12       PROM -- WRITE-TRAP TEST.
                                        ;;#################################################################
006212  000004                        TST12:  SCOPE
006214  012737  000100  001160                MOV     #100,$TIMES     ;;DO 100 ITERATIONS
                                        .ENABL LSB
006222  012737  006246  001110                MOV     #1$,$LPERR      ;SET FOR SWR9 OPTION IN 'ERROR'
006230  013701  001424                        MOV     PRM,R1          ;INIT PROM ADDRESS.

006234  020137  001420          5$:     CMP     R1,RAM          ;IF RAM IS WITHIN PROM SPACE...
006240  001002                        BNE     1$
006242  062701  001000                ADD     #512.,R1        ;...SKIP 256 PROM LOCATIONS.

006246  011102                  1$:     MOV     (R1),R2         ;SAVE PROM WORD...
006250  010211                        MOV     R2,(R1)         ;...AND TRY TO RE-WRITE IT.
                                                                ;IT SHOULD TRAP AND RETURN TO WTRTN

                                        ;;#################################################################
                                        ;NO-TRAP IS AN ERROR CONDITION.
                                        ;
006252  010137  001122          WRT12:  MOV     R1,$BDADR       ;ERROR, FAILING ADDRESS
006256  010237  001124                  MOV     R2,$GDDAT       ;DATA WAS ...
006262  011137  001126                  MOV     (R1),$BDDAT     ;DATA IS ... (SHOULD BE SAME.)
006266  104012                          ERROR   12              ;PRINT ERROR "ITEM 12".
006270  000400                          BR      WTRTN           ;CONTINUE AFTER ERROR (SWR9=0)
                                                                ;...OR RETRY AT 1$ (SWR9=1)
                                        ;;#################################################################
                                        ;YOU'RE HERE IF THE WRITE ATTEMPT TRAPPED.
                                        ;
006272  020137  001426          WTRTN:  CMP     R1,PRMEND       ;END OF PROM ??
006276  001402                          BEQ     4$              ;YES
006300  005721                          TST     (R1)+           ;NO, BUMP POINTER
006302  000754                          BR      5$              ;...AND DO THE NEXT ADDRESS.

006304  013737  001106  001110  4$:     MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
006312  000400                          BR      TST13           ;;DONE, NEXT TEST.
                                        .DSABL LSB
```

```
                                        ;;#################################################################
                                        ;#TEST 13       PROM DATA TEST -- ENGINEERING USE ONLY.
                                        ;;#################################################################
006314  000004                          TST13:  SCOPE
006316  012737  000100  001160                  MOV     #100,$TIMES     ;;DO 100 ITERATIONS
                                        ;
                                        ;IF SPECIAL TEST PROM INSTALLED, DO THIS TEST.
                                        ;SKIP TO END-PASS OTHERWISE.
                                        ;
006324  005737  001432                  1$:     TST     PRMX            ;SPECIAL TEST PROM ??
006330  001010                                  BNE     XTEST           ;YES, EXECUTE THIS TEST.
006332  005037  001160                          CLR     $TIMES          ;NO, CLEAR ITER COUNT...
006336  000137  006540                          JMP     $EOP            ;NO, END PASS.
                                        ;
                                        ;FOR THIS TEST, A SPECIAL SET OF PROM CHIPS (8) MUST BE
                                        ;INSTALLED IN THE PROM BOARD.  THESE CHIPS (2/K) ARE BLASTED
                                        ;WITH THE FOLLOWING DATA PATTERN:
                                        ;
                                        ;       1ST K   010000 THRU 011777
                                        ;       2ND K   022000      023777
                                        ;       3RD K   044000      045777
                                        ;       4TH K   106000      107777
                                        ;
                                        ;NOTE THAT THE BIT PATTERN EMPLOYS TWO FIELDS AS FOLLOWS:
                                        ;       BITS 00-11 FORM A BINARY COUNTER, RANGE 0-7777 (4095.).
                                        ;       BITS 12-15 FORM A RING COUNTER, WHERE;
                                        ;                  BIT 12=1 IN 1ST K.
                                        ;                  BIT 13=1 IN 2ND K.
                                        ;                  BIT 14=1 IN 3RD K.
                                        ;                  BIT 15=1 IN 4TH K.
                                        ;
006342  010000                          K1:     BIT12                   ;BIT12=1 IN 1ST K.
006344  020000                          K2:     BIT13                   ;BIT13=1 IN 2ND K.
006346  040000                          K3:     BIT14                   ;BIT14=1 IN 3RD K.
006350  100000                          K4:     BIT15                   ;BIT15=1 IN 4TH K.
                                        ;
006352  000240                          XTEST:  NOP
006354  000240                                  NOP
006356  012737  006352  001106                  MOV     #XTEST,$LPADR   ;SET ITERATION ADDRESS
006364  012737  006420  001110                  MOV     #5$,$LPERR      ;SET FOR SWR9 OPTION IN 'ERROR'
006372  013701  006342                          MOV     K1,R1           ;INIT PATTERN FOR 1ST K.
006376  013702  001424                          MOV     PRM,R2          ;INIT ADDRESS.
                                        ;
006402  020237  001420                  6$:     CMP     R2,RAM          ;IF RAM IS WITHIN PROM SPACE...
006406  001004                                  BNE     5$
006410  062702  001000                          ADD     #512.,R2        ;...SKIP 256 PROM LOCATIONS.
006414  062701  000400                          ADD     #256.,R1        ;...ADJUST PATTERN ACCORDINGLY.
                                        ;
006420  020112                          5$:     CMP     R1,(R2)         ;COMPARE THIS(NEXT) LOCATION.
006422  001036                                  BNE     10$             ;ERROR
006424  005201                          11$:    INC     R1              ;BUMP PATTERN WORD...
006426  005722                                  TST     (R2)+           ;...AND ADDRESS.
                                        ;
006430  022701  012000                          CMP     #12000,R1       ;1ST K DONE ??
```

```
                006434  001412                  BEQ     1$              ;YES
                006436  022701  024000          CMP     #24000,R1       ;2ND K DONE ??
                006442  001412                  BEQ     2$              ;YES
                006444  022701  046000          CMP     #46000,R1       ;3RD K DONE ??
                006450  001412                  BEQ     3$              ;YES
                006452  022701  110000          CMP     #110000,R1      ;4TH K DONE ??
                006456  001412                  BEQ     4$              ;YES
                006460  000757                  BR      5$              ;CONTINUE IN CURRENT SECTION.

                006462  063701  006342  1$:     ADD     K1,R1           ;INIT PATTERN FOR 2ND K.
                006466  000745                  BR      6$
                006470  063701  006344  2$:     ADD     K2,R1           ;INIT PATTERN FOR 3RD K.
                006474  000742                  BR      6$
                006476  063701  006346  3$:     ADD     K3,R1           ;INIT PATTERN FOR 4TH K.
                006502  000737                  BR      6$

                006504  000240  4$:     NOP
                006506  000240                  NOP
                006510  013737  001106  001110  MOV     $LPADR,$LPERR   ;SET FOR SWR9 OPTION IN 'SCOPE'
                006516  000410                  BR      $EOP            ;;DONE, END-OF-PASS

                ;;**************************************************************
                006520  010237  001122  10$:    MOV     R2,$BDADR       ;FAILING ADDRESS
                006524  010137  001124          MOV     R1,$GDDAT       ;GOOD DATA
                006530  011237  001126          MOV     (R2),$BDDAT     ;BAD DATA
                006534  104010                  ERROR   10              ;PRINT ERROR "ITEM 10".
                006536  000732                  BR      11$             ;...AND GO ON (SWR9=0).
                                                                        ;...OR RETRY AT 5$ (SWR9=1)
                ;;**************************************************************
```

```
                                        .SBTTL  END OF PASS ROUTINE
                                        ;;*****************************************************************
                                        ;*INCREMENT THE PASS NUMBER ($PASS)
                                        ;*TYPE "END PASS #XXXXX" (WHERE XXXXX IS A DECIMAL NUMBER)
                                        ;*IF THERES A MONITOR GO TO IT
                                        ;*IF THERE ISN'T JUMP TO AGAIN
                                        ;
006540                                  SEOP:
006540 000004                                   SCOPE
006542 005037 001102                            CLR     $TSTNM          ;;ZERO THE TEST NUMBER
006546 005037 001160                            CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
006552 005237 001202                            INC     $PASS           ;;INCREMENT THE PASS NUMBER
006556 042737 100000 001202                     BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
006564 005327                                   DEC     (PC)+           ;;LOOP?
006566 000001                           SEOPCT: .WORD   1
006570 003022                                   BGT     $DOAGN          ;;YES
006572 012737                                   MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
006574 000001                           SENDCT: .WORD   1
006576 006566                                   $EOPCT
006600 104401 006645                            TYPE    ,$ENDMG         ;;TYPE "END PASS #"
006604 013746 001202                            MOV     $PASS,-(SP)     ;;SAVE $PASS FOR TYPEOUT
006610 104405                                   TYPDS                   ;;GO TYPE--DECIMAL ASCII WITH SIGN
006612 104401 006642                            TYPE    ,$ENULL         ;;TYPE A NULL CHARACTER
006616 013700 000042                    $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
006622 001405                                   BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
006624 000005                                   RESET                   ;;CLEAR THE WORLD
006626 004710                           $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
006630 000240                                   NOP                     ;;SAVE ROOM
006632 000240                                   NOP                     ;;FOR
006634 000240                                   NOP                     ;;ACT11
006636                                  $DOAGN:
006636 000137                                   JMP     @(PC)+          ;;RETURN
006640 002624                           $RTNAD: .WORD   AGAIN
006642     377      377      000        $ENULL: .BYTE   -1,-1,0         ;;NULL CHARACTER STRING
006645     015   042412   042116        $ENDMG: .ASCIZ  <15><12>/END PASS #/
006652  050040   051501   020123
006660  000043
```

```
                                .SBTTL  COMMON SUBROUTINES AND TABLES
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;THIS ROUTINE WILL TEST FOR A NEXM IN THE RANGE (R1) THRU (R2).
                                ;
                                ;CALL:  MOV ADR1,R1
                                ;       MOV ADR2,R2
                                ;       JSR PC,NXM
                                ;       RETURN IF BUSERR TRAP
                                ;       RETURN IF NO-TRAP
                                ;
006662  005711                  NXM:    TST     (R1)            ;TEST THE ADDRESSES...
006664  005712                          TST     (R2)            ;...IF EITHER TRAPS, RETURN TO NXM1.
006666  062716  000002                  ADD     #2,(SP)         ;IF NOT, BUMP RETURN PC...
006672  000207                          RTS     PC              ;...AND RETURN TO CALL+6.
006674  000207                  NXM1:   RTS     PC              ;ONE OR THE OTHER TRAPPED...
                                                                ;...RETURN TO CALL+4.
                                ;+++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
                                ;BUS TIME-OUT PROCESSER.  BUS ERRORS ARE EXPECTED DURING
                                ;INITIALIZATION, AND IN TESTS 1 AND 12.
                                ;IF ANY OTHER, REPORT BUS-ERROR, AND HALT.
                                ;
006676  022716  002740          TIMOUT: CMP     #RD1,(SP)       ;TST1 READ TRAP ??
006702  001003                          BNE     1$              ;NO
006704  012716  002774                  MOV     #RTN1,(SP)      ;YES, ADJUST RETURN PC
006710  000002                          RTI                     ;AND RETURN THERE.
                                ;
006712  022716  002744          1$:     CMP     #WRT1,(SP)      ;TST1 WRITE TRAP ??
006716  001003                          BNE     2$              ;NO
006720  012716  003024                  MOV     #RTN2,(SP)      ;YES...
006724  000002                          RTI                     ;...RETURN THERE
                                ;
006726  022716  006252          2$:     CMP     #WRT12,(SP)     ;TST12 WRITE TRAP ??
006732  001003                          BNE     3$              ;NO
006734  012716  006272                  MOV     #WTRTN,(SP)     ;YES...
006740  000002                          RTI                     ;...RETURN THERE.
                                ;
006742  022716  006664          3$:     CMP     #NXM+2,(SP)     ;NEXM ROUTINE TRAP 1 ??
006746  001403                          BEQ     4$              ;YES
006750  022716  006666                  CMP     #NXM+4,(SP)     ;NO, NEXM TRAP 2 ??
006754  001003                          BNE     5$              ;NO
006756  012716  006674          4$:     MOV     #NXM1,(SP)      ;RETURN TO NEXM ROUTINE.
006762  000002                          RTI
                                ;
006764                          5$:
006764  012637  001122                  MOV     (SP)+,$BDADR    ;;POP STACK INTO $BDADR
006770  012637  001126                  MOV     (SP)+,$BDDAT    ;;POP STACK INTO $BDDAT
006774  012737  007004  001110          MOV     #STOP,$LPERR    ;OVERRIDE SWR9 OPTION.
007002  104013                          ERROR   13              ;REPORT BUS ERROR...
                                                                ;...$BDADR = TRAP PC
                                                                ;...$BDDAT = TRAP PS
007004  000000          STOP:   HALT                            ;STOP...
007006  000137  001436                  JMP     START           ;...RESTART ON "CONTINUE".
```

```
                                ;#################################################################
                                ;MEMORY MAP FOR TEST 1.
                                ;THE MAP CONSISTS OF 2 WORDS FOR EACH 4K BANK THRU 32K.
                                ;
                                ;WORD 1 IS THE READ MAP WHERE EACH BIT REPRESENTS 1 256 WORD
                                ;SEGMENT OF THE BANK. EACH BIT IS SET 0 IF THAT SEGMENT IS
                                ;"NEXM", SET 1 OTHERWISE.
                                ;
                                ;WORD 2 IS THE WRITE MAP FOR THE SAME BANK.  EACH BIT IS
                                ;SET 0 IF THAT SEGMENT IS "READ-ONLY" OR "NEXM", SET 1 OTHERWISE.
                                ;
                                ;BIT# TO ADDRESS CORRESPONDENCE IS AS FOLLOWS:
                                ;
                                ;       BIT #   RANGE
                                ;       15      0 - 776
                                ;       14      1000 - 1776
                                ;       13      2000 - 2776
                                ;       12      3000 - 3776
                                ;       11      4000 - 4776
                                ;       10      5000 - 5776
                                ;       09      6000 - 6776
                                ;       08      7000 - 7776
                                ;       07      10000 - 10776
                                ;       06      11000 - 11776
                                ;       05      12000 - 12776
                                ;       04      13000 - 13776
                                ;       03      14000 - 14776
                                ;       02      15000 - 15776
                                ;       01      16000 - 16776
                                ;       00      17000 - 17776
                                ;
007012  007024          RMAP:   .WORD   MEMMAP          ;POINTS TO 1ST WORD IN PAIR.
007014  007026          WMAP:   .WORD   MEMMAP+2        ;POINTS TO 2ND WORD IN PAIR.
007016  000020          MAPK:   .WORD   16.             ;BIT (SEGMENT) COUNTER.
007020  000000          LOC:    .WORD   0               ;POINTS TO LOC TO TEST.
007022      000   000   MAPSW:  .BYTE   0,0             ;LO BYTE IS TYPE/INHIB SWITCH
                                                        ;HI BYTE IS COPY/COMPARE SWITCH
007024  000020          MEMMAP: .BLKW   16.             ;THIS IS THE WORKING (SCRATCH) MAP.
                                                        ;2 WORDS/4K BANK AS DESCRIBED ABOVE.
007064  000020          SAVMAP: .BLKW   16.             ;INITIAL COPY OF "MEMMAP" IS SAVED
                                                        ;HERE AS THE REFERENCE MAP.
                                ;
                                ;#################################################################
                                ;SUBROUTINE TO DUMP A 32K MAP AND HALT.  START AT LOC 220.
                                ;
                        001456  STARTM=START+20
007124  012737  177777  001434  MDUMP:  MOV     #-1,MAINT       ;SET MAINT FLAG.
007132  012706  001100          MOV     #STACK,SP       ;INIT THE STACK
007136  004737  001456          JSR     PC,STARTM       ;INIT VECTORS, AND RETURN.
007142  005037  007022          CLR     MAPSW           ;ENABLE MAP OUTPUT.
007146  004737  002670          JSR     PC,TST1A        ;...DO IT...
007152  005037  001434          CLR     MAINT           ;...RETURN...
007156  000000                  HALT                    ;...AND HALT.
007160  000137  007124          JMP     MDUMP
```

```
                                        ;;#################################################################
                                        ;THIS ROUTINE WILL OUTPUT ANY GIVEN MEM RANGE TO THE
                                        ;CONSOLE TTY.
                                        ;
                                        ;START AT LOC 210 TO DUMP OCTAL,
                                        ;     AND LOC 214 TO DUMP BINARY.
                                        ;
                                        ;OPERATOR IS REQUIRED TO INPUT FIRST ADDRESS,
                                        ;AND NUMBER OF WORDS TO DUMP.
                                        ;
                                        ;AN ODD ADDRESS INPUT WILL BE DECREMENTED BY 1, BEFORE USE.
                                        ;WORD COUNT INPUT MUST BE NON-ZERO.
                                        ;RESTART DUMPER AT END.
                                        ;
007164  000000                  MODE:   0                       ; 0 = OCTAL, -1 = BINARY
007166  000000                  ADDRS:  0                       ;ADDRESS OF DUMP RANGE
007170  000000                  WORDS:  0                       ;WORD COUNT
007172  000000                  LINE:   0                       ;NUMBER OF WORDS/LINE

007174  012737  177777  001434  ODUMP:  MOV     #-1,MAINT       ;SET MAINT FLAG
007202  012706  001100                  MOV     #STACK,SP       ;INIT THE STACK
007206  004737  001456                  JSR     PC,STARTM       ;INIT VECTORS, AND RETURN
007212  005037  001434                  CLR     MAINT
007216  104401  007224                  TYPE    ,65$            ;;TYPE ASCIZ STRING
007222  000417                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF><CRLF>/OCTAL MEMORY DUMP ROUTINE./<CRLF>
007262                          64$:
007262  005037  007164                  CLR     MODE            ; 0 = OCTAL DUMP
007266  012737  000004  007172          MOV     #4,LINE         ;WITH 4 WORDS PER LINE.
007274  000442                          BR      DSTRT

007276  012737  177777  001434  BDUMP:  MOV     #-1,MAINT       ;SET MAINT FLAG
007304  012706  001100                  MOV     #STACK,SP       ;INIT THE STACK
007310  004737  001456                  JSR     PC,STARTM       ;INIT VECTORS, AND RETURN
007314  005037  001434                  CLR     MAINT
007320  104401  007326                  TYPE    ,65$            ;;TYPE ASCIZ STRING
007324  000420                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF><CRLF>/BINARY MEMORY DUMP ROUTINE./<CRLF>
007366                          64$:
007366  012737  177777  007164          MOV     #-1,MODE        ;-1 = BINARY DUMP
007374  012737  000002  007172          MOV     #2,LINE         ;WITH 2 WORDS PER LINE.

007402                          DSTRT:
007402  104401  007410                  TYPE    ,65$            ;;TYPE ASCIZ STRING
007406  000411                          BR      64$             ;;GET OVER THE ASCIZ
                                ;;65$:  .ASCIZ  <CRLF>/FIRST ADDRESS = /
007432                          64$:
007432  104413                          RDOCT                   ;RECEIVE HIS RESPONSE.
007434  012637  007166                  MOV     (SP)+,ADDRS     ;;POP STACK INTO ADDRS
007440  042737  000001  007166          BIC     #BIT0,ADDRS     ;INSURE ITS AN EVEN ADDRESS.

007446                          2$:
007446  104401  007454                  TYPE    ,67$            ;;TYPE ASCIZ STRING
007452  000414                          BR      66$             ;;GET OVER THE ASCIZ
```

```
                                        ;;67$:  .ASCIZ  <CRLF>/WORD COUNT (OCTAL) = /
                                        66$:
007504                                          RDOCT                   ;GET THE NUMBER
007504  104413                                  MOV     (SP)+,WORDS     ;;POP STACK INTO WORDS
007506  012637  007170                          BEQ     2$              ;CANT USE 0, ASK FOR ANOTHER.
007512  001755
                                                MOV     ADDRS,R1        ;FIRST ADDRESS IN R1.
007514  013701  007166                          MOV     WORDS,R2        ;WORD COUNT...
007520  013702  007170                          ASL     R2              ;...TIMES 2 = BYTE COUNT.
007524  006302                                  ADD     #-2,R2          ;ADJUST
007526  062702  177776                          ADD     R1,R2           ;PLUS (R1) = LAST ADDR IN R2.
007532  060102                                  JSR     PC,NXM          ;SEE IF THE RANGE IS VALID.
007534  004737  006662                          BR      10$             ;ITS NOT, RANGE IS NEXM.
007540  000401                                  BR      DMPGO           ;IT IS, START DUMPING.
007542  000403
                                        10$:    TYPE    ,M3             ;INVALID DUMP RANGE.
007544  104401  013412                          BR      DSTRT           ;TRY AGAIN.
007550  000714
                                        DMPGO:  TYPE    ,$CRLF
007552  104401  001171                          MOV     ADDRS,-(SP)     ;;PUSH ADDRS ON STACK
007556  013746  007166                          TYPOS                   ;TYPE THE ADDRESS.
007562  104403                                  .BYTE   6
007564     006                                  .BYTE   0               ;SUPPRESS LEAD ZEROS.
007565     000                                  MOV     LINE,R1         ;SET WORDS/LINE COUNT
007566  013701  007172
                                        3$:     TYPE    ,SPACE3         ;3 SPACES BETWEEN WORDS
007572  104401  007650                          MOV     @ADDRS,-(SP)    ;;PUSH @ADDRS ON STACK
007576  017746  177364                          TST     MODE
007602  005737  007164                          BEQ     1$
007606  001402                                  TYPBN                   ;TYPE BINARY DATA.
007610  104406                                  BR      2$
007612  000401
                                        1$:     TYPOC                   ;TYPE OCTAL DATA.
007614  104402                          2$:     ADD     #2,ADDRS        ;BUMP ADDRESS POINTER.
007616  062737  000002  007166                  DEC     WORDS           ;AND WORD COUNT
007624  005337  007170                          BEQ     4$              ;QUIT WHEN WC = 0.
007630  001403
                                                DEC     R1              ;BUMP WORDS/LINE COUNT
007632  005301                                  BEQ     DMPGO           ;START A NEW LINE
007634  001746                                  BR      3$              ;NEXT WORD, THIS LINE
007636  000755
                                        4$:     TYPE    ,$CRLF
007640  104401  001171                          NOP
007644  000240                                  BR      DSTRT           ;RESTART ON 'CONT'
007646  000655
                                        SPACE3: .BYTE   40,40,40,0      ;3 SPACES
007650     040     040     040
007653     000
```

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

007654                                  $SCOPE:
007654  104410                                  CKSWR                   ;;TEST  FOR CHANGE IN SOFT-SWR
007656  032777  040000  171254          1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
007664  001131                                  BNE     $OVER           ;;YES IF SW14=1
                                        ;#####START OF CODE FOR THE XOR TESTER#####
007666  000416                          $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
                                                                        ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
007670  013746  000004                          MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
007674  012737  007714  000004                  MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
007702  005737  177060                          TST     @#177060        ;;TIME OUT ON XOR?
007706  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
007712  000500                                  BR      $SVLAD          ;;GO TO THE NEXT TEST
007714  022626                          5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
007716  012637  000004                          MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
007722  000440                                  BR      7$              ;;LOOP ON THE PRESENT TEST
007724                                  6$:;#####END OF CODE FOR THE XOR TESTER#####
007724  032777  000400  171206                  BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
007732  001421                                  BEQ     2$              ;;BR IF NO
007734  005046                                  CLR     -(SP)           ;;CLEAR A TEMP. LOCATION
007736  117716  171176                          MOVB    @SWR,(SP)       ;;PICKUP THE DESIRED TEST NUMBER
007742  001414                                  BEQ     8$              ;;BRANCH IF BAD TEST NUMBER IN SWR
007744  022716  000013                          CMP     #13,(SP)        ;;CHECK THE NUMBER IN THE SWR
007750  002411                                  BLT     8$              ;;BRANCH IF TEST NUMBER IS OUT OF RANGE
007752  011637  001102                          MOV     (SP),$TSTNM     ;;UPDATE THE TEST NUMBER
007756  005316                                  DEC     (SP)            ;;BACKUP BY ONE
007760  006316                                  ASL     (SP)            ;;SCALE THE TEST NUMBER AS AN INDEX
007762  062716  010166                          ADD     #$SW08TBL,(SP)  ;;FORM THE ADDRESS OF TEST POINTER
007766  013637  001106                          MOV     @(SP)+,$LPADR   ;;SET LOOP ADDRESS TO DESIRED TEST
007772  000466                                  BR      $OVER           ;;GO LOOP ON THE TEST
007774  005726                          8$:     TST     (SP)+           ;;CLEAN THE BAD TEST NUMBER OFF OF THE STACK
007776  105737  001103                  2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
010002  001421                                  BEQ     3$              ;;BR IF NO
010004  123737  001115  001103                  CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
010012  101015                                  BHI     3$              ;;BR IF NO
010014  032777  001000  171116                  BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
010022  001404                                  BEQ     4$              ;;BR IF NO
010024  013737  001110  001106          7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
010032  000446                                  BR      $OVER
010034  105037  001103                  4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
```

```
1955  010040  005037  001160                CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
1956  010044  000415                        BR      1$              ;;ESCAPE TO THE NEXT TEST
1957  010046  032777  004000  171064  3$:   BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
1958  010054  001011                        BNE     1$              ;;BR IF YES
1959  010056  005737  001202                TST     $PASS           ;;IF FIRST PASS OF PROGRAM
1960  010062  001406                        BEQ     1$              ;;     INHIBIT ITERATIONS
1961  010064  005237  001104                INC     $ICNT           ;;INCREMENT ITERATION COUNT
1962  010070  023737  001160  001104        CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
1963  010076  002024                        BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
1964  010100  012737  000001  001104  1$:   MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
1965  010106  013737  010164  001160        MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
1966  010114  105237  001102          $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
1967  010120  113737  001102  001200        MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
1968  010126  011637  001106                MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
1969  010132  011637  001110                MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
1970  010136  005037  001162                CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
1971  010142  112737  000001  001115        MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
1972  010150  013777  001102  170764  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
1973  010156  013716  001106                MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
1974  010162  000002                        RTI                     ;;FIXES PS
1975  010164  003720                $MXCNT:  2000.                   ;;MAX. NUMBER OF ITERATIONS
1976  010166                         $SW08TBL:
1977  010166  002632                        .WORD   TST1+2          ;;STARTING ADDRESS OF TEST 1
1978  010170  003364                        .WORD   TST2+2          ;;STARTING ADDRESS OF TEST 2
1979  010172  003546                        .WORD   TST3+2          ;;STARTING ADDRESS OF TEST 3
1980  010174  003662                        .WORD   TST4+2          ;;STARTING ADDRESS OF TEST 4
1981  010176  004766                        .WORD   TST5+2          ;;STARTING ADDRESS OF TEST 5
1982  010200  005024                        .WORD   TST6+2          ;;STARTING ADDRESS OF TEST 6
1983  010202  005372                        .WORD   TST7+2          ;;STARTING ADDRESS OF TEST 7
1984  010204  005540                        .WORD   TST10+2         ;;STARTING ADDRESS OF TEST 10
1985  010206  006030                        .WORD   TST11+2         ;;STARTING ADDRESS OF TEST 11
1986  010210  006214                        .WORD   TST12+2         ;;STARTING ADDRESS OF TEST 12
1987  010212  006316                        .WORD   TST13+2         ;;STARTING ADDRESS OF TEST 13
```

```
                                        .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 SERRTYP 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
                                
010214                          SERROR:
                                        CKSWR                           ;;TEST FOR CHANGE IN SOFT-SWR
010214  104410
010216  105237  001103          7$:     INCB    SERFLG                  ;;SET THE ERROR FLAG
010222  001775                          BEQ     7$                      ;;DON'T LET THE FLAG GO TO ZERO
010224  013777  001102  170710          MOV     $TSTNM,@DISPLAY         ;;DISPLAY TEST NUMBER AND ERROR FLAG
010232  032777  002000  170700          BIT     #BIT10,@SWR             ;;BELL ON ERROR?
010240  001402                          BEQ     1$                      ;;NO - SKIP
010242  104401  001164                  TYPE    ,$BELL                  ;;RING BELL
010246  005237  001112          1$:     INC     $ERTTL                  ;;COUNT THE NUMBER OF ERRORS
010252  011637  001116                  MOV     (SP),$ERRPC             ;;GET ADDRESS OF ERROR INSTRUCTION
010256  162737  000002  001116          SUB     #2,$ERRPC
010264  117737  170626  001114          MOVB    @$ERRPC,$ITEMB          ;;STRIP AND SAVE THE ERROR ITEM CODE
010272  032777  020000  170640          BIT     #BIT13,@SWR             ;;SKIP TYPEOUT IF SET
010300  001004                          BNE     20$                     ;;SKIP TYPEOUTS
010302  004737  010414                  JSR     PC,$ERRTYP              ;;GO TO USER ERROR ROUTINE
010306  104401  001171                  TYPE    ,$CRLF
010312                          20$:
010312  122737  000001  001214          CMPB    #APTENV,$ENV            ;;RUNNING IN APT MODE
010320  001007                          BNE     2$                      ;;NO,SKIP APT ERROR REPORT
010322  113737  001114  010334          MOVB    $ITEMB,21$              ;;SET ITEM NUMBER AS ERROR NUMBER
010330  004737  012670                  JSR     PC,$ATY4                ;;REPORT FATAL ERROR TO APT
010334      000         21$:    .BYTE   0
010335      000                 .BYTE   0
010336  000777          22$:    BR      22$                             ;;APT ERROR LOOP
010340  005777  170574          2$:     TST     @SWR                    ;;HALT ON ERROR
010344  100002                          BPL     3$                      ;;SKIP IF CONTINUE
010346  000000                          HALT                            ;;HALT ON ERROR!
010350  104410                          CKSWR                           ;;TEST FOR CHANGE IN SOFT-SWR
010352  032777  001000  170560  3$:     BIT     #BIT09,@SWR             ;;LOOP ON ERROR SWITCH SET?
010360  001402                          BEQ     4$                      ;;BR IF NO
010362  013716  001110                  MOV     $LPERR,(SP)             ;;FUDGE RETURN FOR LOOPING
010366  005737  001162          4$:     TST     $ESCAPE                 ;;CHECK FOR AN ESCAPE ADDRESS
010372  001402                          BEQ     5$                      ;;BR IF NONE
010374  013716  001162                  MOV     $ESCAPE,(SP)            ;;FUDGE RETURN ADDRESS FOR ESCAPE
010400                          5$:
010400  022737  006626  000042          CMP     #$ENDAD,@#42            ;;ACT-11 AUTO-ACCEPT?
010406  001001                          BNE     6$                      ;;BRANCH IF NO
010410  000000                          HALT                            ;;YES
010412                          6$:
010412  000002                          RTI                             ;;RETURN
```

```
                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE

                                ;;**********************************************************************
                                ;;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
                                ;;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
                                ;;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.

010414                          $ERRTYP:
010414  104401  001171                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
010420  010046                          MOV     R0,-(SP)        ;;SAVE R0
010422  005000                          CLR     R0              ;;PICKUP THE ITEM INDEX
010424  153700  001114                  BISB    @#$ITEMB,R0
010430  001004                          BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
                                                                ;;TYPE THE PC OF THE ERROR
010432  013746  001116                  MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
                                                                ;;ERROR ADDRESS
010436  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
010440  000426                          BR      6$              ;;GET OUT
010442  005300                  1$:     DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
010444  006300                          ASL     R0              ;;      WORK FOR THE ERROR TABLE
010446  006300                          ASL     R0
010450  006300                          ASL     R0
010452  062700  001260                  ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
010456  012037  010466                  MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
010462  001404                          BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
010464  104401                          TYPE                    ;;TYPE THE "ERROR MESSAGE"
010466  000000                  2$:     .WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
010470  104401  001171                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
010474  012037  010504          3$:     MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
010500  001404                          BEQ     5$              ;;SKIP TYPEOUT IF 0
010502  104401                          TYPE                    ;;TYPE THE "DATA HEADER"
010504  000000                  4$:     .WORD   0               ;;"DATA HEADER" POINTER GOES HERE
010506  104401  001171                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
010512  011000                  5$:     MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
010514  001004                          BNE     7$              ;;GO TYPE THE DATA
010516  012600                  6$:     MOV     (SP)+,R0        ;;RESTORE R0
010520  104401  001171                  TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
010524  000207                          RTS     PC              ;;RETURN
010526                          7$:
010526  013046                          MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
010530  104402                          TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
010532  005710                          TST     (R0)            ;;IS THERE ANOTHER NUMBER?
010534  001770                          BEQ     6$              ;;BR IF NO
010536  104401  010544                  TYPE    ,8$             ;;TYPE TWO(2) SPACES
010542  000771                          BR      7$              ;;LOOP
010544  020040      000         8$:     .ASCIZ  /  /            ;;TWO(2) SPACES
010550                                  .EVEN
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                                        .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
                                        ;*
010550  105737  001157          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
010554  100002                          BPL     1$              ;;BR IF YES
010556  000000                          HALT                    ;;HALT HERE IF NO TERMINAL
010560  000430                          BR      3$              ;;LEAVE
010562  010046                  1$:     MOV     R0,-(SP)        ;;SAVE R0
010564  017600  000002                  MOV     2(SP),R0        ;;GET ADDRESS OF ASCIZ STRING
010570  122737  000001  001214          CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
010576  001011                          BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
010600  132737  000100  001215          BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
010606  001405                          BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
010610  010037  010620                  MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
010614  004737  012660                  JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
010620  000000                  61$:    .WORD   0               ;;MESSAGE ADDRESS
010622  132737  000040  001215  62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
010630  001003                          BNE     60$             ;;YES,SKIP TYPE OUT
010632  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
010634  001005                          BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
010636  005726                          TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
010640  012600                  60$:    MOV     (SP)+,R0        ;;RESTORE R0
010642  062716  000002          3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
010646  000002                          RTI                     ;;RETURN
010650  122716  000011          4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
010654  001430                          BEQ     8$
010656  122716  000200                  CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
010662  001006                          BNE     5$
010664  005726                          TST     (SP)+           ;;POP  <CR><LF> EQUIV
010666  104401                          TYPE                    ;;TYPE A CR AND LF
010670  001171                          $CRLF
010672  105037  011026                  CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
010676  000755                          BR      2$              ;;GET NEXT CHARACTER
010700  004737  010762          5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
010704  123726  001156          6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
010710  001350                          BNE     2$              ;;IF NO GO GET NEXT CHAR.
010712  013746  001154                  MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                                ;;AND THE NULL CHAR.
010716  105366  000001          7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
010722  002770                          BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
```

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2143  010724  004737  010762                    JSR     PC,$TYPEC       ;;GO TYPE A NULL
2144  010730  105337  011026                    DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
2145  010734  000770                            BR      7$              ;;LOOP
2146
2147                                    ;HORIZONTAL TAB PROCESSOR
2148
2149  010736  112716  000040            8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
2150  010742  004737  010762            9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
2151  010746  132737  000007  011026            BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
2152  010754  001372                            BNE     9$              ;;TAB STOP
2153  010756  005726                            TST     (SP)+           ;;POP SPACE OFF STACK
2154  010760  000724                            BR      2$              ;;GET NEXT CHARACTER
2155  010762  105777  170162          $TYPEC:   TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
2156  010766  100375                            BPL     $TYPEC
2157  010770  116677  000002  170154            MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
2158  010776  122766  000015  000002            CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
2159  011004  001003                            BNE     1$              ;;BRANCH IF NO
2160  011006  105037  011026                    CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
2161  011012  000406                            BR      $TYPEX          ;;EXIT
2162  011014  122766  000012  000002  1$:       CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
2163  011022  001402                            BEQ     $TYPEX          ;;BRANCH IF YES
2164  011024  105227                            INCB    (PC)+           ;;COUNT THE CHARACTER
2165  011026  000000          $CHARCNT:.WORD    0                       ;;CHARACTER COUNT STORAGE
2166  011030  000207          $TYPEX: RTS       PC
2167
```

```
                                .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
                                ;
011032                          $TYPDS:
011032  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
011034  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
011036  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
011040  010346                          MOV     R3,-(SP)        ;;PUSH R3 ON STACK
011042  010546                          MOV     R5,-(SP)        ;;PUSH R5 ON STACK
011044  012746  020200                  MOV     #20200,-(SP)    ;;SET BLANK SWITCH AND SIGN
011050  016605  000020                  MOV     20(SP),R5       ;;GET THE INPUT NUMBER
011054  100004                          BPL     1$              ;;BR IF INPUT IS POS.
011056  005405                          NEG     R5              ;;MAKE THE BINARY NUMBER POS.
011060  112766  000055  000001          MOVB    #'-,1(SP)       ;;MAKE THE ASCII NUMBER NEG.
011066  005000                  1$:     CLR     R0              ;;ZERO THE CONSTANTS INDEX
011070  012703  011246                  MOV     #$DBLK,R3       ;;SETUP THE OUTPUT POINTER
011074  112723  000040                  MOVB    #' ,(R3)+       ;;SET THE FIRST CHARACTER TO A BLANK
011100  005002                  2$:     CLR     R2              ;;CLEAR THE BCD NUMBER
011102  016001  011236                  MOV     $DTBL(R0),R1    ;;GET THE CONSTANT
011106  160105                  3$:     SUB     R1,R5           ;;FORM THIS BCD DIGIT
011110  002402                          BLT     4$              ;;BR IF DONE
011112  005202                          INC     R2              ;;INCREASE THE BCD DIGIT BY 1
011114  000774                          BR      3$
011116  060105                  4$:     ADD     R1,R5           ;;ADD BACK THE CONSTANT
011120  005702                          TST     R2              ;;CHECK IF BCD DIGIT=0
011122  001002                          BNE     5$              ;;FALL THROUGH IF 0
011124  105716                          TSTB    (SP)            ;;STILL DOING LEADING 0'S?
011126  100407                          BMI     7$              ;;BR IF YES
011130  106316                  5$:     ASLB    (SP)            ;;MSD?
011132  103003                          BCC     6$              ;;BR IF NO
011134  116663  000001  177777          MOVB    1(SP),-1(R3)    ;;YES--SET THE SIGN
011142  052702  000060          6$:     BIS     #'0,R2          ;;MAKE THE BCD DIGIT ASCII
011146  052702  000040          7$:     BIS     #' ,R2          ;;MAKE IT A SPACE IF NOT ALREADY A DIGIT
011152  110223                          MOVB    R2,(R3)+        ;;PUT THIS CHARACTER IN THE OUTPUT BUFFER
011154  005720                          TST     (R0)+           ;;JUST INCREMENTING
011156  020027  000010                  CMP     R0,#10          ;;CHECK THE TABLE INDEX
011162  002746                          BLT     2$              ;;GO DO THE NEXT DIGIT
011164  003002                          BGT     8$              ;;GO TO EXIT
011166  010502                          MOV     R5,R2           ;;GET THE LSD
011170  000764                          BR      6$              ;;GO CHANGE TO ASCII
011172  105726                  8$:     TSTB    (SP)+           ;;WAS THE LSD THE FIRST NON-ZERO?
011174  100003                          BPL     9$              ;;BR IF NO
011176  116663  177777  177776          MOVB    -1(SP),-2(R3)   ;;YES--SET THE SIGN FOR TYPING
011204  105013                  9$:     CLRB    (R3)            ;;SET THE TERMINATOR
011206  012605                          MOV     (SP)+,R5        ;;POP STACK INTO R5
```

```
2222  011210  012603                        MOV     (SP)+,R3        ;;POP STACK INTO R3
2223  011212  012602                        MOV     (SP)+,R2        ;;POP STACK INTO R2
2224  011214  012601                        MOV     (SP)+,R1        ;;POP STACK INTO R1
2225  011216  012600                        MOV     (SP)+,R0        ;;POP STACK INTO R0
2226  011220  104401  011246                TYPE    ,$DBLK          ;;NOW TYPE THE NUMBER
2227  011224  016666  000002  000004        MOV     2(SP),4(SP)     ;;ADJUST THE STACK
2228  011232  012616                        MOV     (SP)+,(SP)
2229  011234  000002                        RTI                     ;;RETURN TO USER
2230  011236  023420                SDTBL:  10000.
2231  011240  001750                        1000.
2232  011242  000144                        100.
2233  011244  000012                        10.
2234  011246  000004                SDBLK:  .BLKW   4
```

```
                                .SBTTL  BINARY TO OCTAL (ASCII) AND TYPE

                                ;;*****************************************************************
                                ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 6-DIGIT
                                ;*OCTAL (ASCII) NUMBER AND TYPE IT.
                                ;*$TYPOS---ENTER HERE TO SETUP SUPPRESS ZEROS AND NUMBER OF DIGITS TO TYPE
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOS                   ;;CALL FOR TYPEOUT
                                ;*      .BYTE   N               ;;N=1 TO 6 FOR NUMBER OF DIGITS TO TYPE
                                ;*      .BYTE   M               ;;M=1 OR 0
                                ;*                                      ;;1=TYPE LEADING ZEROS
                                ;*                                      ;;0=SUPPRESS LEADING ZEROS
                                ;*
                                ;*$TYPON----ENTER HERE TO TYPE OUT WITH THE SAME PARAMETERS AS THE LAST
                                ;*$TYPOS OR $TYPOC
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPON                   ;;CALL FOR TYPEOUT
                                ;*
                                ;*$TYPOC---ENTER HERE FOR TYPEOUT OF A 16 BIT NUMBER
                                ;*CALL:
                                ;*      MOV     NUM,-(SP)       ;;NUMBER TO BE TYPED
                                ;*      TYPOC                   ;;CALL FOR TYPEOUT

011256  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
011262  116637  000001  011501          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
011270  112637  011503                  MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
011274  062716  000002                  ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
011300  000406                          BR      $TYPON
011302  112737  000001  011501  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
011310  112737  000006  011503          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
011316  112737  000005  011500  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
011324  010346                          MOV     R3,-(SP)        ;;SAVE R3
011326  010446                          MOV     R4,-(SP)        ;;SAVE R4
011330  010546                          MOV     R5,-(SP)        ;;SAVE R5
011332  113704  011503                  MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
011336  005404                          NEG     R4
011340  062704  000006                  ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
011344  110437  011502                  MOVB    R4,$OMODE       ;;SAVE IT FOR USE
011350  113704  011501                  MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
011354  016605  000012                  MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
011360  005003                          CLR     R3              ;;CLEAR THE OUTPUT WORD
011362  006105                  1$:     ROL     R5              ;;ROTATE MSB INTO "C"
011364  000404                          BR      3$              ;;GO DO MSB
011366  006105                  2$:     ROL     R5              ;;FORM THIS DIGIT
011370  006105                          ROL     R5
011372  006105                          ROL     R5
011374  010503                          MOV     R5,R3
011376  006103                  3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
011400  105337  011502                  DECB    $OMODE          ;;TYPE THIS DIGIT?
011404  100016                          BPL     7$              ;;BR IF NO
011406  042703  177770                  BIC     #177770,R3      ;;GET RID OF JUNK
011412  001002                          BNE     4$              ;;TEST FOR 0
```

```
2289  011414  005704                        TST     R4              ;;SUPPRESS THIS 0?
2290  011416  001403                        BEQ     5$              ;;BR IF YES
2291  011420  005204                4$:     INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
2292  011422  052703  000060              BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
2293  011426  052703  000040              BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
2294  011432  110337  011476              MOVB    R3,@#8$         ;;SAVE FOR TYPING
2295  011436  104401  011476              TYPE    ,@#8$           ;;GO TYPE THIS DIGIT
2296  011442  105337  011500              DECB    @#$OCNT         ;;COUNT BY 1
2297  011446  003347                      BGT     2$              ;;BR IF MORE TO DO
2298  011450  002402                      BLT     6$              ;;BR IF DONE
2299  011452  005204                      INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
2300  011454  000744                      BR      2$              ;;GO DO THE LAST DIGIT
2301  011456  012605                6$:     MOV     (SP)+,R5        ;;RESTORE R5
2302  011460  012604                        MOV     (SP)+,R4        ;;RESTORE R4
2303  011462  012603                        MOV     (SP)+,R3        ;;RESTORE R3
2304  011464  016666  000002  000004       MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
2305  011472  012616                        MOV     (SP)+,(SP)
2306  011474  000002                        RTI                     ;;RETURN
2307  011476  000                   8$:     .BYTE   0               ;;STORAGE FOR ASCII DIGIT
2308  011477  000                           .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
2309  011500  000                   $OCNT:  .BYTE   0               ;;OCTAL DIGIT COUNTER
2310  011501  000                   $OFILL: .BYTE   0               ;;ZERO FILL SWITCH
2311  011502  000000                $OMODE: .WORD   0               ;;NUMBER OF DIGITS TO TYPE
```

```
2312                                    .SBTTL  BINARY TO ASCII AND TYPE ROUTINE
2313
2314                                    ;;**********************************************************************
2315                                    ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 16-BIT
2316                                    ;*BINARY-ASCII NUMBER AND TYPE IT.
2317                                    ;*CALL:
2318                                    ;*      MOV     NUMBER,-(SP)    ;;NUMBER TO BE TYPED
2319                                    ;*      TYPBN                   ;;TYPE IT
2320
2321  011504  010146                    $TYPBN: MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
2322  011506  016601  000006                    MOV     6(SP),R1        ;;GET THE INPUT NUMBER
2323  011512  000261                            SEC                     ;;SET "C" SO CAN KEEP TRACK OF THE NUMBER OF BITS
2324  011514  112737  000060  011556  1$:      MOVB    #'0,$BIN        ;;SET CHARACTER TO AN ASCII "0".
2325  011522  006101                            ROL     R1              ;;GET THIS BIT
2326  011524  001406                            BEQ     2$              ;;DONE?
2327  011526  105537  011556                    ADCB    $BIN            ;;NO--SET THE CHARACTER EQUAL TO THIS BIT
2328  011532  104401  011556                    TYPE    ,$BIN           ;;GO TYPE THIS BIT
2329  011536  000241                            CLC                     ;;CLEAR "C" SO CAN KEEP TRACK OF BITS
2330  011540  000765                            BR      1$              ;;GO DO THE NEXT BIT
2331  011542  012601                    2$:     MOV     (SP)+,R1        ;;POP THE STACK INTO R1
2332  011544  016666  000002  000004            MOV     2(SP),4(SP)     ;;ADJUST THE STACK
2333  011552  012616                            MOV     (SP)+,(SP)
2334  011554  000002                            RTI                     ;;RETURN TO USER
2335  011556     000     000            $BIN:   .BYTE   0,0             ;;STORAGE FOR ASCII CHAR. AND TERMINATOR
```

```
                                        .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.
011560  022737  000176  001140  $CKSWR: CMP     @#SWREG,SWR     ;;IS THE SOFT-SWR SELECTED?
011566  001074                         BNE     15$             ;;BRANCH IF NO
011570  105777  167350                 TSTB    @#TKS           ;;CHAR THERE?
011574  100071                         BPL     15$             ;;IF NO, DON'T WAIT AROUND
011576  117746  167344                 MOVB    @#TKB,-(SP)     ;;SAVE THE CHAR
011602  042716  177600                 BIC     #^C177,(SP)     ;;STRIP-OFF THE ASCII
011606  022726  000007                 CMP     #7,(SP)+        ;;IS IT A CONTROL G?
011612  001062                         BNE     15$             ;;NO, RETURN TO USER
011614  123727  001134  000001         CMPB    $AUTOB,#1       ;;ARE WE RUNNING IN AUTO-MODE?
011622  001456                         BEQ     15$             ;;BRANCH IF YES
                                        ;
011624  104401  012305                 TYPE    ,$CNTLG         ;;ECHO THE CONTROL-G (^G)
011630  104401  012312         $GTSWR: TYPE    ,$MSWR          ;;TYPE CURRENT CONTENTS
011634  013746  000176                 MOV     $SWREG,-(SP)    ;;SAVE SWREG FOR TYPEOUT
011640  104402                         TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
011642  104401  012323                 TYPE    ,$MNEW          ;;PROMPT FOR NEW SWR
011646  005046                 19$:    CLR     -(SP)           ;;CLEAR COUNTER
011650  005046                         CLR     -(SP)           ;;THE NEW SWR
011652  105777  167266         7$:     TSTB    @#TKS           ;;CHAR THERE?
011656  100375                         BPL     7$              ;;IF NOT TRY AGAIN
                                        ;
011660  117746  167262                 MOVB    @#TKB,-(SP)     ;;PICK UP CHAR
011664  042716  177600                 BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
                                        ;
                                        ;
011670  021627  000025         9$:     CMP     (SP),#25        ;;IS IT A CONTROL-U?
011674  001005                         BNE     10$             ;;BRANCH IF NOT
011676  104401  012300                 TYPE    ,$CNTLU         ;;YES, ECHO CONTROL-U (^U)
011702  062706  000006         20$:    ADD     #6,SP           ;;IGNORE PREVIOUS INPUT
011706  000757                         BR      19$             ;;LET'S TRY IT AGAIN
                                        ;
                                        ;
011710  021627  000015         10$:    CMP     (SP),#15        ;;IS IT A <CR>?
011714  001022                         BNE     16$             ;;BRANCH IF NO
011716  005766  000004                 TST     4(SP)           ;;YES, IS IT THE FIRST CHAR?
011722  001403                         BEQ     11$             ;;BRANCH IF YES
011724  016677  000002  167206         MOV     2(SP),@#SWR     ;;SAVE NEW SWR
011732  062706  000006         11$:    ADD     #6,SP           ;;CLEAR UP STACK
011736  104401  001171         14$:    TYPE    ,$CRLF          ;;ECHO <CR> AND <LF>
011742  123727  001135  000001         CMPB    $INTAG,#1       ;;RE-ENABLE TTY KBD INTERRUPTS?
011750  001003                         BNE     15$             ;;BRANCH IF NOT
011752  012777  000100  167164         MOV     #100,@#TKS      ;;RE-ENABLE TTY KBD INTERRUPTS
011760  000002                 15$:    RTI                     ;;RETURN
```

```
2390  011762  004737  010762          16$:    JSR     PC,$TYPEC       ;;ECHO CHAR
2391  011766  021627  000060                  CMP     (SP),#60        ;;CHAR < 0?
2392  011772  002420                          BLT     18$             ;;BRANCH IF YES
2393  011774  021627  000067                  CMP     (SP),#67        ;;CHAR > 7?
2394  012000  003015                          BGT     18$             ;;BRANCH IF YES
2395  012002  042726  000060                  BIC     #60,(SP)+       ;;STRIP-OFF ASCII
2396  012006  005766  000002                  TST     2(SP)           ;;IS THIS THE FIRST CHAR
2397  012012  001403                          BEQ     17$             ;;BRANCH IF YES
2398  012014  006316                          ASL     (SP)            ;;NO, SHIFT PRESENT
2399  012016  006316                          ASL     (SP)            ;;    CHAR OVER TO MAKE
2400  012020  006316                          ASL     (SP)            ;;    ROOM FOR NEW ONE.
2401  012022  005266  000002          17$:    INC     2(SP)           ;;KEEP COUNT OF CHAR
2402  012026  056616  177776                  BIS     -2(SP),(SP)     ;;SET IN NEW CHAR
2403  012032  000707                          BR      7$              ;;GET THE NEXT ONE
2404  012034  104401  001170          18$:    TYPE    ,$QUES          ;;TYPE ?<CR><LF>
2405  012040  000720                          BR      20$             ;;SIMULATE CONTROL-U
2406                                  .DSABL  LSB
2407
2408
2409                                  ;;*****************************************************************
2410                                  ;;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
2411                                  ;;*CALL:
2412                                  ;;*     RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
2413                                  ;;*     RETURN HERE             ;;CHARACTER IS ON THE STACK
2414                                  ;;*                             ;;WITH PARITY BIT STRIPPED OFF
2415                                  ;;*
2416
2417  012042  011646                  $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
2418  012044  016666  000004  000002          MOV     4(SP),2(SP)     ;;SAVE THE PS
2419  012052  105777  167066          1$:     TSTB    @$TKS           ;;WAIT FOR
2420  012056  100375                          BPL     1$              ;;A CHARACTER
2421  012060  117766  167062  000004          MOVB    @$TKB,4(SP)     ;;READ THE TTY
2422  012066  042766  177600  000004          BIC     #^C(177),4(SP)  ;;GET RID OF JUNK IF ANY
2423  012074  026627  000004  000023          CMP     4(SP),#23       ;;IS IT A CONTROL-S?
2424  012102  001013                          BNE     3$              ;;BRANCH IF NO
2425  012104  105777  167034          2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
2426  012110  100375                          BPL     2$              ;;LOOP UNTIL ITS THERE
2427  012112  117746  167030                  MOVB    @$TKB,-(SP)     ;;GET CHARACTER
2428  012116  042716  177600                  BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
2429  012122  022627  000021                  CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
2430  012126  001366                          BNE     2$              ;;IF NOT DISCARD IT
2431  012130  000750                          BR      1$              ;;YES, RESUME
2432  012132  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
2433  012140  002407                          BLT     4$              ;;BRANCH IF YES
2434  012142  026627  000004  000175          CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
2435  012150  003003                          BGT     4$              ;;BRANCH IF YES
2436  012152  042766  000040  000004          BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
2437  012160  000002                  4$:     RTI                     ;;GO BACK TO USER
2438                                  ;;*****************************************************************
2439                                  ;;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
2440                                  ;;*CALL:
2441                                  ;;*     RDLIN                   ;;INPUT A STRING FROM THE TTY
2442                                  ;;*     RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
2443                                  ;;*                             ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
```

```
2444
2445  012162  010346                SRDLIN: MOV     R3,-(SP)        ;;SAVE R3
2446  012164  012703  012270         1$:     MOV     #STTYIN,R3      ;;GET ADDRESS
2447  012170  022703  012300         2$:     CMP     #STTYIN+8.,R3   ;;BUFFER FULL?
2448  012174  101405                        BLOS    4$              ;;BR IF YES
2449  012176  104411                        RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
2450  012200  112613                        MOVB    (SP)+,(R3)      ;;GET CHARACTER
2451  012202  122713  000177        10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
2452  012206  001003                        BNE     3$              ;;SKIP IF NOT
2453  012210  104401  001170        4$:     TYPE    ,SQUES          ;;TYPE A '?'
2454  012214  000763                        BR      1$              ;;CLEAR THE BUFFER AND LOOP
2455  012216  111337  012266        3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
2456  012222  104401  012266                TYPE    ,9$
2457  012226  122723  000015                CMPB    #15,(R3)+       ;;CHECK FOR RETURN
2458  012232  001356                        BNE     2$              ;;LOOP IF NOT RETURN
2459  012234  105063  177777                CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
2460  012240  104401  001172                TYPE    ,$LF            ;;TYPE A LINE FEED
2461  012244  012603                        MOV     (SP)+,R3        ;;RESTORE R3
2462  012246  011646                        MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
2463  012250  016666  000004  000002        MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
2464  012256  012766  012270  000004        MOV     #STTYIN,4(SP)
2465  012264  000002                        RTI                     ;;RETURN
2466  012266  000            9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
2467  012267  000                    .BYTE   0               ;;TERMINATOR
2468  012270  000010         STTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
2469  012300  052536  005015  000  $CNTLU: .ASCIZ  /↑U/<15><12>    ;;CONTROL "U"
2470  012305  136  103507  000012  $CNTLG: .ASCIZ  /↑G/<15><12>    ;;CONTROL "G"
2471  012312  005015  053523  020122  $MSWR:  .ASCIZ  <15><12>/SWR = /
2472  012320  020075  000
2473  012323  040  047040  053505  $MNEW:  .ASCIZ  /  NEW = /
2474  012330  036440  000040
```

```
                                .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
                                ;;
                                ;;#################################################################
                                ;;#
                                ;;#THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
                                ;;#CHANGE IT TO BINARY.
                                ;;#THE INPUT CHARACTERS WILL BE CHECKED TO INSURED THEY ARE LEGAL
                                ;;#OCTAL DIGITS. IF AN ILLEGAL CHARACTER IS READ A "?" WILL BE TYPED
                                ;;#FOLLOWED BY A CARRIAGE RETURN-LINE FEED. THE COMPLETE NUMBER MUST
                                ;;#THEN BE RETYPED. THE INPUT IS TERMINATED BY TYPING A CARRIAGE RETURN.
                                ;;#CALL:
                                ;;#      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;;#      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;;#                              ;;HIGH ORDER BITS ARE IN $HIOCT
                                ;;
012334  011646                  $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
012336  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
012344  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
012346  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
012350  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
012352  104412                  1$:     RDLIN                   ;;READ AN ASCIZ LINE
012354  012600                          MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
012356  010037  012462                  MOV     R0,5$           ;;AND SAVE IT
012362  005001                          CLR     R1              ;;CLEAR DATA WORD
012364  005002                          CLR     R2
012366  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
012370  001420                          BEQ     3$              ;;IF ZERO GET OUT
012372  122716  000060                  CMPB    #'0,(SP)        ;;MAKE SURE THIS CHARACTER
012376  003026                          BGT     4$              ;;IS AN OCTAL DIGIT
012400  122716  000067                  CMPB    #'7,(SP)
012404  002423                          BLT     4$
012406  006301                          ASL     R1              ;;*2
012410  006102                          ROL     R2
012412  006301                          ASL     R1              ;;*4
012414  006102                          ROL     R2
012416  006301                          ASL     R1              ;;*8
012420  006102                          ROL     R2
012422  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
012426  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
012430  000756                          BR      2$              ;;LOOP
012432  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
012434  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
012440  010237  012472                  MOV     R2,$HIOCT
012444  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
012446  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
012450  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
012452  000002                          RTI                     ;;RETURN
012454  005726                  4$:     TST     (SP)+           ;;CLEAN PARTIAL FROM STACK
012456  105010                          CLRB    (R0)            ;;SET A TERMINATOR
012460  104401                          TYPE                    ;;TYPE UP THRU THE BAD CHAR.
012462  000000                  5$:     .WORD   0
012464  104401  001170                  TYPE    ,$QUES          ;;"?" "CR" & "LF"
012470  000730                          BR      1$              ;;TRY AGAIN
012472  000000                  $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
                                        .SBTTL  POWER DOWN AND UP ROUTINES
                                
                                        ;;**********************************************************************
                                        ;POWER DOWN ROUTINE
012474  012737  012634  000024  $PWRDN: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST UP
012502  012737  000340  000026          MOV     #340,@#PWRVEC+2  ;;PRIO:7
012510  010046                          MOV     R0,-(SP)         ;;PUSH R0 ON STACK
012512  010146                          MOV     R1,-(SP)         ;;PUSH R1 ON STACK
012514  010246                          MOV     R2,-(SP)         ;;PUSH R2 ON STACK
012516  010346                          MOV     R3,-(SP)         ;;PUSH R3 ON STACK
012520  010446                          MOV     R4,-(SP)         ;;PUSH R4 ON STACK
012522  010546                          MOV     R5,-(SP)         ;;PUSH R5 ON STACK
012524  017746  166410                  MOV     @$SWR,-(SP)      ;;PUSH @$WR ON STACK
012530  010637  012640                  MOV     SP,$SAVR6        ;;SAVE SP
012534  012737  012546  000024          MOV     #$PWRUP,@#PWRVEC ;;SET UP VECTOR
012542  000000                          HALT
012544  000776                          BR      .-2              ;;HANG UP
                                
                                        ;;**********************************************************************
                                        ;POWER UP ROUTINE
012546  012737  012634  000024  $PWRUP: MOV     #$ILLUP,@#PWRVEC ;;SET FOR FAST DOWN
012554  013706  012640                  MOV     $SAVR6,SP        ;;GET SP
012560  005037  012640                  CLR     $SAVR6           ;;WAIT LOOP FOR THE TTY
012564  005237  012640          1$:     INC     $SAVR6           ;;WAIT FOR THE INC
012570  001375                          BNE     1$               ;;OF  WORD
012572  012677  166342                  MOV     (SP)+,@$SWR      ;;POP STACK INTO @$WR
012576  012605                          MOV     (SP)+,R5         ;;POP STACK INTO R5
012600  012604                          MOV     (SP)+,R4         ;;POP STACK INTO R4
012602  012603                          MOV     (SP)+,R3         ;;POP STACK INTO R3
012604  012602                          MOV     (SP)+,R2         ;;POP STACK INTO R2
012606  012601                          MOV     (SP)+,R1         ;;POP STACK INTO R1
012610  012600                          MOV     (SP)+,R0         ;;POP STACK INTO R0
012612  012737  012474  000024          MOV     #$PWRDN,@#PWRVEC ;;SET UP THE POWER DOWN VECTOR
012620  012737  000340  000026          MOV     #340,@#PWRVEC+2  ;;PRIO:7
012626  104401                          TYPE                     ;REPORT THE POWER FAILURE
012630  012642          $PWRMG: .WORD   $POWER                   ;;POWER FAIL MESSAGE POINTER
012632  000002                  RTI
012634  000000          $ILLUP: HALT                             ;;THE POWER UP SEQUENCE WAS STARTED
012636  000776                  BR      .-2                      ;;  BEFORE THE POWER DOWN WAS COMPLETE
012640  000000          $SAVR6: 0                                ;;PUT THE SP HERE
012642  005015  047520  042527  $POWER: .ASCIZ  <15><12>"POWER"
012650  000122                  .EVEN
```

```
                                .SBTTL  APT COMMUNICATIONS ROUTINE
                                ;;*****************************************************************
012652  112737  000001  013116  $ATY1:   MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
012660  112737  000001  013114  $ATY3:   MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
012666  000403                  BR      $ATYC
012670  112737  000001  013116  $ATY4:   MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
012676                          $ATYC:
012676  010046                  MOV     R0,-(SP)        ;;PUSH R0 ON STACK
012700  010146                  MOV     R1,-(SP)        ;;PUSH R1 ON STACK
012702  105737  013114          TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
012706  001450                  BEQ     5$              ;;IF NOT:  BR
012710  122737  000001  001214  CMPB    @#APTENV,$ENV   ;;OPERATING UNDER APT?
012716  001031                  BNE     3$              ;;IF NOT:  BR
012720  132737  000100  001215  BITB    @#APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
012726  001425                  BEQ     3$              ;;IF NOT:  BR
012730  017600  000004          MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
012734  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
012742  005737  001174  1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
012746  001375                  BNE     1$              ;;IF NOT:  WAIT
012750  010037  001210          MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
012754  105720          2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
012756  001376                  BNE     2$
012760  163700  001210          SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
012764  006200                  ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
012766  010037  001212          MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
012772  012737  000004  001174  MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
013000  000413                  BR      5$
013002  017637  000004  013026  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
013010  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
013016  013746  177776          MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
013022  004737  010550          JSR     PC,$TYPE        ;;CALL TYPE MACRO
013026  000000          4$:     .WORD   0
013030                  5$:
013030  105737  013116  10$:     TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
013034  001416                  BEQ     12$             ;;IF NOT:  BR
013036  005737  001214          TST     $ENV            ;;RUNNING UNDER APT?
013042  001413                  BEQ     12$             ;;IF NOT:  BR
013044  005737  001174  11$:     TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
013050  001375                  BNE     11$             ;;IF NOT:  WAIT
013052  017637  000004  001176  MOV     @4(SP),$FATAL   ;;GET ERROR #
013060  062766  000002  000004  ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
013066  005237  001174          INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
013072  105037  013116  12$:     CLRB    $FFLG           ;;CLEAR FATAL FLAG
013076  105037  013115          CLRB    $LFLG           ;;CLEAR LOG FLAG
013102  105037  013114          CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
013106  012601                  MOV     (SP)+,R1        ;;POP STACK INTO R1
013110  012600                  MOV     (SP)+,R0        ;;POP STACK INTO R0
013112  000207                  RTS     PC              ;;RETURN
013114     000  $MFLG:   .BYTE   0               ;;MESSG. FLAG
013115     000  $LFLG:   .BYTE   0               ;;LOG FLAG
013116     000  $FFLG:   .BYTE   0               ;;FATAL FLAG
013120                          .EVEN
000200                  APTSIZE=200
```

```
  2625            000001                  APTENV=001
  2626            000100                  APTSPOOL=100
  2627            000040                  APTCSUP=040
```

```
                                .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.

013120  010046                  STRAP:  MOV     R0,-(SP)        ;;SAVE R0
013122  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
013126  005740                          TST     -(R0)           ;;BACKUP BY 2
013130  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
013132  006300                          ASL     R0              ;;POSITION FOR INDEXING
013134  016000  013154                  MOV     STRPAD(R0),R0   ;;INDEX TO TABLE
013140  000200                          RTS     R0              ;;GO TO ROUTINE

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

013142  011646                  STRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
013144  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
013152  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

                                ;#THIS TABLE CONTAINS THE STARTING ADDRESSES OF THE ROUTINES CALLED
                                ;#BY THE "TRAP" INSTRUCTION.

                                ;       ROUTINE
                                ;       -------
013154  013142                  STRPAD: .WORD   STRAP2
                                        $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
                                        $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
                                        $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
                                        $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
                                        $TYPDS  ;;CALL=TYPDS    TRAP+5(104405)  TYPE DECIMAL NUMBER (WITH SIGN)
                                        $TYPBN  ;;CALL=TYPBN    TRAP+6(104406)  TYPE BINARY (ASCII) NUMBER

013172  011630                          $GTSWR  ;;CALL=GTSWR    TRAP+7(104407)  GET SOFT-SWR SETTING

013174  011560                          $CKSWR  ;;CALL=CKSWR    TRAP+10(104410) TEST FOR CHANGE IN SOFT-SWR
013176  012042                          $RDCHR  ;;CALL=RDCHR    TRAP+11(104411) TTY TYPEIN CHARACTER ROUTINE
013200  012162                          $RDLIN  ;;CALL=RDLIN    TRAP+12(104412) TTY TYPEIN STRING ROUTINE
013202  012334                          $RDOCT  ;;CALL=RDOCT    TRAP+13(104413) READ AN OCTAL NUMBER FROM TTY
```

```
                                .SBTTL  ERROR MESSAGES AND MISCELLANEOUS.
                                ;;*****************************************************************
013204 047111 040526 044514     M1:     .ASCII  /INVALID RAM ADDRESS RANGE./<CRLF>
013212 020104 040522 020115
013220 042101 051104 051505
013226 020123 040522 043516
013234 027105 000200
013237 000115 054105 020115             .ASCIZ  /NEXM OR NOT ON 256 WORD BOUNDARY./
013244 051117 047040 052117
013252 047440 020116 032462
013260 020056 047527 042122
013266 041040 052517 042116
013274 051101 027131 000200
013301 000111 053116 046101     M2:     .ASCII  /INVALID PROM ADDRESS RANGE./<CRLF>
013306 042111 050040 047522
013314 020115 042101 051104
013322 051505 020123 040522
013330 043516 027105 000200
013336 000116 054105 026115             .ASCIZ  /NEXM, INCORRECT SIZE, OR NOT ON 1K BOUNDARY./
013342 044440 041516 051117
013350 042522 052103 051440
013356 055111 026105 047440
013364 020122 047516 020124
013372 047117 030440 020113
013400 047502 047124 040504
013406 054522 000056
013412 047111 040526 044514     M3:     .ASCIZ  /INVALID DUMP RANGE./
013420 020104 052504 050115
013426 051040 047101 042507
013434 000056
013436 040522 020115 042522     EM1:    .ASCIZ  /RAM READ-WRITE ERROR./
013444 042101 053455 044522
013452 042524 042440 051122
013460 051117 000056
013466 042524 052123 004443     DH1:    .ASCIZ  /TEST#  ERRPC   ADDR    GOOD    BAD/
013472 051105 050122 004503
013500 042101 051104 043411
013506 047517 004504 040502
013514 000104
                                .EVEN
013516 001200 001116 001122     DT1:    .WORD   $TESTN,$ERRPC,$BDADR,$GDDAT,$BDDAT,0
013524 001124 001126 000000
013532 040522 020115 042101     EM2:    .ASCIZ  /RAM ADDRESS ERROR./
013540 051104 051505 020123
013546 051105 047522 027122
013554 000200
013555 000124 051505 021524     DH2:    .ASCIZ  /TEST#  ERRPC   ADDR    GOOD    BAD/
013562 042411 051122 041520
013570 040411 042104 004522
013576 047507 042117 041011
013604 042101 000200
013610
                                .EVEN
013610 001200 001116 001122     DT2:    .WORD   $TESTN,$ERRPC,$BDADR,$GDDAT,$BDDAT,0
013616 001124 001126 000000
```

```
013624  040522  020115  040506  EM3:    .ASCIZ  /RAM FAST READ ERROR./
013632  052123  051040  040505
013640  020104  051105  047522
013646  027122     000
013651     124  051505  021524  DH3:    .ASCIZ  /TEST#  ERRPC   ADDR    GOOD    RAMDAT  BUFDAT/
013656  042411  051122  041520
013664  040411  042104  004522
013672  047507  042117  051011
013700  046501  040504  004524
013706  052502  042106  052101
013714     000
        013716                                  .EVEN
013716  001200  001116  001120  DT3:    .WORD   $TESTN,$ERRPC,$GDADR,$GDADR,$BDADR,$BDDAT,0
013724  001120  001122  001126
013732  000000
013734  040522  020115  046123  EM4:    .ASCIZ  /RAM SLIDING BIT.  ADDR-2 WAS ALTERED./
013742  042111  047111  020107
013750  044502  027124  020040
013756  042101  051104  031055
013764  053440  051501  040440
013772  052114  051105  042105
014000  000056
014002  042524  052123  004443  DH4:    .ASCIZ  /TEST#  ERRPC   ADDR    PATRN   ADR-2   GOOD    BAD/
014010  051105  050122  004503
014016  042101  051104  050011
014024  052101  047122  040411
014032  051104  031055  043411
014040  047517  004504  040502
014046  000104
                                        .EVEN
014050  001200  001116  001120  DT4:    .WORD   $TESTN,$ERRPC,$GDADR,$GDDAT,$BDADR,FILLR,$BDDAT,0
014056  001124  001122  005060
014064  001126  000000
014070  040522  020115  046123  EM5:    .ASCIZ  /RAM SLIDING BIT.  ADDR+2 WAS ALTERED./
014076  042111  047111  020107
014104  044502  027124  020040
014112  042101  051104  031053
014120  053440  051501  040440
014126  052114  051105  042105
014134  000056
014136  042524  052123  004443  DH5:    .ASCIZ  /TEST#  ERRPC   ADDR    PATRN   ADR+2   GOOD    BAD/
014144  051105  050122  004503
014152  042101  051104  050011
014160  052101  047122  040411
014166  051104  031053  043411
014174  047517  004504  040502
014202  000104
                                        .EVEN
014204  001200  001116  001120  DT5:    .WORD   $TESTN,$ERRPC,$GDADR,$GDDAT,$BDADR,FILLR,$BDDAT,0
014212  001124  001122  005060
014220  001126  000000
014224  040522  020115  046101  EM6:    .ASCIZ  /RAM ALTERNATE BIT PATTERN ERROR./
014232  042524  047122  052101
014240  020105  044502  020124
```

```
014246  040520  052124  051105
014254  020116  051105  047522
014262  027122     000
014265     124  051505  021524  DH6:    .ASCIZ  /TEST#  ERRPC   ADDR    GOOD    BAD/
014272  042411  051122  041520
014300  040411  042104  004522
014306  047507  042117  041011
014314  042101     000
        014320                          .EVEN
014320  001200  001116  001120  DT6:    .WORD   $TESTN,$ERRPC,$GDADR,$GDDAT,$BDDAT,0
014326  001124  001126  000000
014334  040522  020115  054502  EM7:    .ASCIZ  /RAM BYTE TEST ERROR./
014342  042524  052040  051505
014350  020124  051105  047522
014356  027122     000
014361     124  051505  021524  DH7:    .ASCIZ  /TEST#  ERRPC   ADDR    GOOD    BAD     BYTE/
014366  042411  051122  041520
014374  040411  042104  004522
014402  047507  042117  041011
014410  042101  041011  052131
014416  000105
                                        .EVEN
014420  001200  001116  001120  DT7:    .WORD   $TESTN,$ERRPC,$GDADR,$GDDAT,$BDDAT,$BDADR,0
014426  001124  001126  001122
014434  000000
014436  051120  046517  051040  EM10:   .ASCIZ  /PROM READ ERROR./
014444  040505  020104  051105
014452  047522  027122     000
014457     124  051505  021524  DH10:   .ASCIZ  /TEST#  ERRPC   ADDR    GOOD    BAD/
014464  042411  051122  041520
014472  040411  042104  004522
014500  047507  042117  041011
014506  042101     000
        014512                          .EVEN
014512  001200  001116  001122  DT10:   .WORD   $TESTN,$ERRPC,$BDADR,$GDDAT,$BDDAT,0
014520  001124  001126  000000
014526  051120  046517  051055  EM11:   .ASCIZ  /PROM-RAM COPY ERROR./
014534  046501  041440  050117
014542  020131  051105  047522
014550  027122     000
014553     124  051505  021524  DH11:   .ASCIZ  /TEST#  ERRPC   PRMADD  PRMDAT  RAMADD  RAMDAT/
014560  042411  051122  041520
014566  050011  046522  042101
014574  004504  051120  042115
014602  052101  051011  046501
014610  042101  004504  040522
014616  042115  052101     000
        014624                          .EVEN
014624  001200  001116  001120  DT11:   .WORD   $TESTN,$ERRPC,$GDADR,$GDDAT,$BDADR,$BDDAT,0
014632  001124  001122  001126
014640  000000
014642  051120  046517  053440  EM12:   .ASCIZ  /PROM WRITE-TRAP ERROR./
014650  044522  042524  052055
014656  040522  020120  051105
```

```
                                                    .ASCIZ  /TEST# ERRPC   ADDR    DATWAS  DATIS/
                                                    .EVEN
                                                    .WORD   $TESTN,$ERRPC,$BDADR,$GDDAT,$BDDAT,0
                                                    .ASCIZ  /BUS TIME-OUT (TRAP) ERROR./
                                                    .ASCIZ  /TEST# TRAPPC  TRAPPS/
                                                    .EVEN
                                                    .WORD   $TESTN,$BDADR,$BDDAT,0
                                                    .ASCII  /MEMORY MAP ERROR./<15><12>/BANK /
                                                    .ASCII  /0  /
                                                    .ASCIZ  /----------------/
                                                    .EVEN
                                                    .WORD   0,0             ;OCTAL FORMAT FOR ALL.
                                                    .ASCIZ  /-/
                                                    .ASCIZ  /R/
                                                    .ASCIZ  /W/
                                                    ;
                                                    ;DATA BUFFER FOR RAM FAST ADDRESS TEST.
                                                    ;
                                                    IBUF:   .BLKW   256.

                                                    ;;**********************************************************************
                                                            NOP             ;END. HERE THRU 17776 IS FREE MEMORY.
                                                            .END
```

DVMRAA.P11 CROSS REFERENCE TABLE

```
ABASE = 020000           502#    731     772
ACOM1 = 140000           503#    731     774
ACOM2 = 000004           504#    731     775
ACPUOP= 000000           731     746
ADDRS   007166          1815#   1848*   1849*   1860    1873    1880    1887*
ADOM0 = 000000           731
ADOM1 = 000000           731
ADOM10= 000000           731
ADOM11= 000000           731
ADOM12= 000000           731
ADOM13= 000000           731
ADOM14= 000000           731
ADOM15= 000000           731
ADOM2 = 000000           731
ADOM3 = 000000           731
ADOM4 = 000000           731
ADOM5 = 000000           731
ADOM6 = 000000           731
ADOM7 = 000000           731
ADOM8 = 000000           731
ADOM9 = 000000           731
ADEVCT= 000000           731     737
ADEVM = 000000           731     773
AENV  = 000000           731     742
AENVM = 000000           731     743
AFATAL= 000000           731     734
AGAIN   002624          1026#   1688
AMADR1= 000000           731     759
AMADR2= 000000           731     763
AMADR3= 000000           731     766
AMADR4= 000000           731     769
AMMSI1= 000000           731     753
AMMSI2= 000000           731     761
AMMSI3= 000000           731     764
AMMSI4= 000000           731     767
AMSGAD= 000000           731     739
AMSGLG= 000000           731     740
AMSGTY= 000000           731     733
AMTYP1= 000000           731     754
AMTYP2= 000000           731     762
AMTYP3= 000000           731     765
AMTYP4= 000000           731     768
APASS = 000000           731     736
APRIOR= 000000           731
APTCSU= 000140          2119    2627#
APTENV= 000001          2019    2112    2583    2625#
APTSIZ= 000200           880    2624#
APTSPO= 000100          2114    2585    2626#
ASWREG= 000000           731     744
ATESTN= 000000           731     735
AUNIT = 000000           731     738
AUSWR = 000000           731     745
AVECT1= 000000           731     770
AVECT2= 000000           731     771
```

BDUMP	007276	537	1831#											
BIT0 =	000001	635#	1849											
BIT00 =	000001	625#	635											
BIT01 =	000002	624#	634											
BIT02 =	000004	623#	633											
BIT03 =	000010	622#	632											
BIT04 =	000020	621#	631											
BIT05 =	000040	620#	630											
BIT06 =	000100	619#	629											
BIT07 =	000200	618#	628											
BIT08 =	000400	617#	627	1932										
BIT09 =	001000	616#	626	1950	2030									
BIT1 =	000002	634#	1128											
BIT10 =	002000	615#	2007											
BIT11 =	004000	614#	1957											
BIT12 =	010000	613#	1603											
BIT13 =	020000	612#	1604	2014										
BIT14 =	040000	611#	1605	1918										
BIT15 =	100000	610#	1606											
BIT2 =	000004	633#												
BIT3 =	000010	632#												
BIT4 =	000020	631#												
BIT5 =	000040	630#												
BIT6 =	000100	629#												
BIT7 =	000200	628#												
BIT8 =	000400	627#												
BIT9 =	001000	626#												
BKG	005640	1423*	1432*	1446#	1449	1457	1481							
BPTVEC=	000014	642#												
BYTTST	005642	1426	1430	1434	1438	1447#								
CKSWR =	104410	1917	2003	2029	2668#									
CR =	000015	550#	2158	2168										
CRLF =	000200	551#	908	940	967	1000	1826	1838	1846	1855	2129	2168	2674	2685
DASH	015114	1066	2867#											
DATTST	003420	1162	1165	1171#										
DDISP =	177570	557#	712	868										
DF	015110	794	797	800	803	806	809	812	815	818	821	824	2866#	
DH1	013464	794	2706#											
DH10	014457	815	2808#											
DH11	014553	818	2820#											
DH12	014671	821	2835#											
DH13	014777	824	2849#											
DH2	013555	797	2718#											
DH3	013651	800	2730#											
DH4	014002	803	2748#											
DH5	014136	806	2766#											
DH6	014265	809	2783#											
DH7	014361	812	2795#											
DISPLA	001142	712#	868*	876*	1972*	2006*								
DISPRE	000174	523#	876											
DMPGO	007552	1867	1872#	1892										
DSTRT	007402	1829	1842#	1870	1897									
DSWR =	177570	556#	711	867										
DT1	013516	794	2712#											

```
ODUMP   007174          536   1819#
PATRN   003416         1161#  1164#  1170#  1173   1180   1189   1197
PC     =X000007         569#   886#   951#  1018#  1100#  1162#  1165#  1186#  1278#  1288#  1336#  1426#  1430#
                       1434#  1438#  1471#  1669#  1672#  1682#  1687   1706#  1707#  1794#  1796#  1821#  1833#
                       1865#  2016#  2022#  2079#  2117#  2136#  2143#  2150#  2164#  2166#  2390#  2602#  2619#
PIRQ   = 177772         555#
PIRQVE= 000240          649#
PRM     001424          834#   923#   931   1002#  1004#  1005   1008   1489   1542   1613
PRMEND  001426          835#   926#   929#   931#  1017#  1513   1564
PRMSZ   001430          836#   924#   970#   971#   973    975#   978    981#   984#   986#   988#   1010
PRMX    001432          837#   922#   972#   980#  1581
PR0    = 000000         572#
PR1    = 000040         573#
PR2    = 000100         574#
PR3    = 000140         575#
PR4    = 000200         576#
PR5    = 000240         577#
PR6    = 000300         578#
PR7    = 000340         579#
PS     = 177776         552#   553
PSW    = 177776         553#
PTRN    005634         1425#  1429#  1437#  1444#  1464   1477
PWRVEC= 000024          644#   855#   856#  2532#  2533#  2542#  2548#  2560#  2561#
R       015116         1075   2868#
RAM     001420          832#   918#   942#   944#   945    947   1172   1179   1206   1214   1239   1253   1296
                       1304   1311   1376   1387   1398   1447   1454   1490   1504   1516   1544   1615
RAMEND  001422          833#   919#   920#   950#  1241   1297   1377
RDCHR  = 104411         2449   2669#
RDLIN  = 104412          968   2494   2670#
RDOCT  = 104413          941   1001   1847   1856   2671#
RD1     002740         1050#  1715
RESVEC= 000010          639#
RMAP    007012         1042#  1052#  1061#  1070#  1079#  1777#
RSTRT   002620          534    933   1021   1025#
RTN1    002774         1060#  1717
RTN2    003024         1069#  1722
R0     =%000000         560#   969#   970   1049#  1050   1102#  1105#  1106   1107   1112   1114   1115   1122
                       1128   1130   1131   1132   1133   1679#  1682   2051   2052#  2053#  2060#  2061#  2062#
                       2063#  2064#  2065   2070   2075#  2077#  2081   2083   2110   2111#  2116   2121   2124#
                       2181   2191#  2195   2211   2212   2225#  2491   2495#  2496   2499   2519#  2522#  2534
                       2559#  2579   2587#  2591   2592   2594#  2595#  2596   2618#  2636   2637#  2638   2639#
                       2640#  2641#  2642#
R1     =%000001         561#   925#   927#   947#   949   1008#  1016   1122#  1123#  1124#  1125#  1126   1135#
                       1141#  1143#  1145#  1149#  1150   1171#  1174#  1177#  1183#  1205#  1209#  1213#  1218#
                       1239#  1244   1250   1253#  1255   1258   1263   1265   1306#  1307   1308   1324#  1328#
                       1333#  1342   1379#  1381   1382#  1388   1391#  1399   1401#  1411   1415   1424#  1428#
                       1433#  1436#  1455#  1459#  1461#  1467#  1476   1489#  1495   1497#  1499   1503#  1505
                       1509   1513   1515   1525   1526   1532   1542#  1544   1546#  1548   1549#  1555   1557
                       1564   1566   1612#  1618#  1620   1622#  1625   1627   1629   1631   1635#  1637#  1639#
                       1649   1703   1860#  1864   1877#  1891#  2182   2195#  2196   2200   2224#  2321   2322#
                       2325#  2331#  2492   2497#  2505#  2507#  2509#  2512#  2515   2518#  2535   2558#  2580
                       2617#
R2     =%000002         562#   948#   949#   950   1009#  1013#  1016#  1017   1172#  1173#  1179#  1180   1190
                       1191   1196#  1197#  1206#  1207#  1208   1214#  1215   1217   1225   1226   1227   1231#
```

```
SW09  = 001000            588#    598
SW1   = 000002            606#
SW10  = 002000            587#
SW11  = 004000            586#
SW12  = 010000            585#
SW13  = 020000            584#
SW14  = 040000            583#
SW15  = 100000            582#
SW2   = 000004            605#
SW3   = 000010            604#
SW4   = 000020            603#
SW5   = 000040            602#
SW6   = 000100            601#
SW7   = 000200            600#
SW8   = 000400            599#
SW9   = 001000            598#
TBITVE= 000014            640#
TIMOUT  006676            527     1715#
TKVEC = 000060            647#
TPVEC = 000064            648#
TRAPVE= 000034            646#     853*    854*
TRTVEC= 000014            641#
TST1    002630           1030#    1977
TST1A   002670           1040#    1110    1796
TST10   005536           1405     1421#   1984
TST11   006026           1440     1487#   1985
TST12   006212           1522     1538#   1986
TST13   006314           1570     1575#   1987
TST2    003362           1117     1159#   1978
TST3    003544           1166     1203#   1979
TST4    003660           1222     1237#   1980
TST5    004764           1260     1274#   1981
TST6    005022           1284#    1982
TST7    005370           1290     1374#   1983
TYPBN = 104406           1883     2664#
TYPDS = 104405           1677     2663#
TYPE  = 104401            894      937     955     964     991     997    1023    1047    1048    1057    1066    1075    1084
                         1090     1675    1678    1823    1835    1843    1852    1869    1872    1879    1895    2009    2017
                         2050     2067    2069    2072    2074    2078    2085    2132    2226    2295    2328    2357    2358
                         2361     2374    2385    2404    2453    2456    2460    2523    2525    2562    2659#
TYPOC = 104402           1886     2058    2082    2360    2660#
TYPON = 104404           2662#
TYPOS = 104403           1874     2661#
W       015120           1057     2869#
WMAP    007014           1043*    1054*   1063*   1072*   1080*   1778#
WORDS   007170           1816#    1857*   1861    1888*
WORDX   005636           1445#    1454*   1455    1464    1466*   1474    1475    1481*
WRT1    002744           1051#    1720
WRT12   006252           1555#    1725
WTRTN   006272           1559     1564#   1727
XTEST   006352           1582     1608#   1610
$APTHD  001000            671      677#
$ASTAT= ****** U         2605     2620
$ATYC   012676           2576     2578#
```

DVMRAA.P11 CROSS REFERENCE TABLE

```
$ATY1   012652          2574#
$ATY3   012660          2117    2575#
$ATY4   012670          2022    2577#
$AUTOB  001134           708#    904*   2354    2475
$BASE   001250           772#    918     919     944
$BDADR  001122           703#   1131*   1136    1147*   1191*   1192*   1225*   1263*   1343*   1351*   1352*   1361*   1362*
                        1368*   1476*   1527*   1555*   1648*   1738*   2712    2724    2738    2756    2774    2802    2814
                        2828    2842    2854
$BDDAT  001126           705#   1133*   1138    1148*   1190*   1227*   1264*   1344*   1353*   1363*   1408*   1475*   1528*
                        1557*   1650*   1739*   2712    2724    2738    2756    2774    2789    2802    2814    2828    2842
                        2854
$BELL   001164           723#   2009    2042
$BIN    011556          2324*   2327*   2328    2335#
$CDW1   001254           774#    923     1004
$CDW2   001256           775#    924     925     975
$CHARC  011026          2134*   2144*   2151    2160*   2165#
$CKSUM  011560          2346#   2668
$CMTAG  001100           691#    842     843     851     857     858     859
$CM3    =  000000        721#
$CNTLG  012305          2357    2470#
$CNTLU  012300          2374    2469#
$CPUOP  001222           746#
$CRLF   001171           725#   1047    1048    1084    1090    1872    1895    2017    2042    2050    2069    2074    2078
                        2133    2168    2385    2469    2528
$DBLK   011246          2192    2226    2234#
$DEVCT  001204           737#
$DEVM   001252           773#
$DOAGN  006636          1671    1680    1686#
$DTBL   011236          2195    2230#
$ENDAD  006626           657     892    1682#   2037
$ENDCT  006574           857    1673#
$ENDMG  006645          1675    1690#
$ENULL  006642          1678    1689#
$ENV    001214           742#    898     915    2019    2112    2583    2607
$ENVM   001215           743#    880    2114    2119    2585
$EOP    006540          1584    1645    1663#
$EOPCT  006566           857*   1670#   1674
$ERFLG  001103           694#   1907    1946    1948    1954*   1976    2004*   2042
$ERMAX  001115           700#    860*   1948    1971*   1976
$ERROR  010214           851    2002#
$ERRPC  001116           701#   2011*   2012*   2013    2042    2056    2712    2724    2738    2756    2774    2789    2802
                        2814    2828    2842
$ERRTB  001260           792#   2064
$ERRTY  010414          2016    2049#
$ERTTL  001112           698#   2010*   2042
$ESCAP  001162           722#    859*   1970*   2033    2035    2042
$ETABL  001214           741#
$ETEND  001260           683     776#
$FATAL  001176           734#   2611*
$FFLG   013116          2574*   2577*   2605    2614*   2622#
$FILLC  001156           719#   2137    2168
$FILLS  001155           718#   2168
$GDADR  001120           702#   1265*   1266*   1349*   1359*   1409*   1410*   1474*   1525*   2738    2756    2774    2789
                        2802    2828
```

DVMRAA.P11 CROSS REFERENCE TABLE

```
$GDDAT  001124          704# 1189* 1226* 1342* 1350* 1360* 1411* 1477* 1526* 1556* 1649* 2712  2724
                       2756  2774  2789  2802  2814  2828  2842
$GET42  006616         1679#
$GTSWR  011630         2358#  2666
$HD     = 000003        498    499
$HIBTS  001000         678#
$HIOCT  012472        2516*  2527#
$ICNT   001104         695#  1961* 1962  1964* 1975
$ILLUP  012634        2532   2548  2565#
$INTAG  001136         709#  2388  2475
$ITEMB  001114         699#  2013* 2021  2042  2053
$LF     001172         726#  2042  2168  2460  2469  2528
$LFLG   013115        2615*  2621#
$LPADR  001106         696#   861* 1035* 1036  1185  1221  1279  1289  1404  1470  1521  1569  1610*
                      1644   1943* 1952* 1968* 1973  1975
$LPERR  001110         697#   862* 1036* 1178* 1185* 1212* 1221* 1279* 1289* 1303* 1386* 1404* 1453*
                      1470*  1493* 1521* 1541* 1569* 1611* 1644* 1740* 1952  1969* 1975  2032
$MADR1  001226         759#
$MADR2  001232         763#
$MADR3  001236         766#
$MADR4  001242         769#
$MAIL   001174         679    683   732#  879   898  1967  2019  2112
$MAMS1  001224         753#
$MAMS2  001230         761#
$MAMS3  001234         764#
$MAMS4  001240         767#
$MBADR  001002         679#
$MFLG   013114        2575*  2581  2616* 2620#
$MMEM   012323        2361   2473#
$MSGAD  001210         739#  2591* 2594
$MSGLG  001212         740#  2596*
$MSGTY  001174         733#  2589  2597* 2609  2613*
$MSWR   012312        2358   2471#
$MTYP1  001225         754#
$MTYP2  001231         762#
$MTYP3  001235         765#
$MTYP4  001241         768#
$MXCNT  010164        1965   1975#
$NULL   001154         717#  2139  2168
$NWTST= 000001         1027# 1156# 1200# 1234# 1271# 1281# 1371# 1418# 1484# 1535# 1572#
$OCNT   011500        2267*  2296* 2309#
$OMODE  011502        2262*  2266* 2271  2274* 2285* 2311#
$OVER   010150        1919   1944  1953  1963  1972#
$PASS   001202         736#   879* 1025* 1667* 1668* 1676  1689  1959  1976
$PASTM  001006         681#
$POWER  012642        2563   2568#
$PWRON  012474         855   2532# 2560
$PWRVC  012630        2563#
$PWRUP  012546        2542   2548#
$QUES   001170         724#   991  2042  2168  2404  2453  2469  2525  2528
$RDCHR  012042        2417#  2669
$RDDEC= ****** U      2672
$RDLIN  012162        2445#  2670
$RDOCT  012334        2489#  2671
```

```
$RDSZ = 000010          2438#
$RTNAD  006640          1688#
$R2A  = ******  U       2672
$SAVRE= ******  U       2672
$SAVR6  012640          2541#   2549    2550#   2551#   2567#
$SCOPE  007654           849    1916#
$SETUP= 000137           840#    848     849     851     853     855     857     858     859     861     892     895     1665
                        1917    2003    2029    2037    2341    2475
$STUP = 177777           840#
$SVLAD  010114          1927    1966#
$SVPC = 000224           655#    660
$SWR  = 167400           498     499#    501#    509     510     511     512     513     514     515     721     722     723
                         858     859     861     862    1031    1160    1204    1238    1275    1285    1375    1422    1488
                        1539    1576    1660    1666    1681    1687    1689    1908    1909    1910    1911    1912    1918
                        1930    1932    1933    1946    1947    1948    1955    1956    1957    1969    1972    1975    1994
                        1995    1996    1997    1998    2007    2014    2026    2030    2042    2564
$SWREG  001216           744#    882
$SWRMK= 000000           515     516    1912    1913    1936
$SWOBT  010166          1942    1976#
$TESTN  001200           735#   1033#   1967#   2712    2724    2738    2756    2774    2789    2802    2814    2828    2842
                        2854
$TIMES  001160           721#    858#   1031#   1160#   1204#   1238#   1275#   1285#   1375#   1422#   1488#   1539#   1576#
                        1583#   1666#   1955#   1962    1965#   1975
$TKB    001146           714#   2339    2350    2367    2421    2427
$TKS    001144           713#   2339    2348    2364    2388#   2419    2425
$TN   = 000014           498#   1027    1031#   1117    1156    1160#   1166    1200    1204#   1222    1234    1238#   1260
                        1271    1275#   1281    1285#   1290    1371    1375#   1405    1418    1422#   1440    1484    1488#
                        1522    1535    1539#   1570    1572    1576#   1937    1977
$TPB    001152           716#   2157#   2168
$TPFLG  001157           720#   2106    2168
$TPS    001150           715#   2155    2168
$TRAP   013120           853    2636#
$TRAP2  013142          2647#   2658
$TRP  = 000014          2651#   2660#   2661#   2662#   2663#   2664#   2665#   2666    2667#   2668    2669#   2670#   2671#
                        2672#
$TRPAD  013154          2641    2658#
$TSTM   001004           680#
$TSTNM  001102           693#   1032#   1665#   1907    1939#   1966#   1967    1972    1976    2006    2042
$TTYIN  012270          2446    2447    2464    2468#
$TYPBN  011504          2321#   2664
$TYPDS  011032          2180#   2663
$TYPE   010550          2106#   2602    2651    2659
$TYPEC  010762          2136    2143    2150    2155#   2156    2390
$TYPEX  011030          2161    2163    2166#
$TYPOC  011302          2265#   2660
$TYPON  011316          2264    2267#   2662
$TYPOS  011256          2260#   2661
$UNIT   001206           738#
$UNITM  001010           682#
$USWR   001220           745#
$VECT1  001244           770#
$VECT2  001246           771#
$XTSTR  007666          1921#
$$GET4= 000000          1681#
```

DVMRAA.P11 CROSS REFERENCE TABLE

```
$$SWDB= 000014          1976#  1977   1978#  1979#  1980#  1981#  1982#  1983#  1984#  1985#  1986#  1987#  1988#
$OFILL  011501          2261*  2265*  2275   2310#
$40CAT= ****** U        1918   2016
.       = 016124         518#   522#   526#   529#   532#   655    656#   658#   660#   661#   667    668#   670#
                         672#   690#   727    846    861    862    885   1000#  1099   1129   1689   1693   1783#
                        1785#  1838#  1855#  1975   1976   2042   2088#  2168   2234#  2339   2468#  2469   2475
                        2528   2544   2566   2623#  2723#  2737#  2788#  2813#  2827#  2841#  2853#  2873#
.$ASTA= ****** U        2575   2578
.$X   = 001000          667#   672
```

CROSS REFERENCE TABLE

```
COMMEN    650#
ENDCOM    650#
ERROR     544#  1152  1193  1228  1267  1345  1354  1364  1412  1478  1529  1558  1651  1741
ESCAPE    650#
GETPRI    650#
GETSWR    650#   895#
MULT      650#
NEWTST    650#  1027  1156  1200  1234  1271  1281  1371  1418  1484  1535  1572
POP       650#   942  1002  1737  1739  1848  1857  2221  2517  2553  2554  2617  2618
PUSH      650#  1873  1880  2180  2491  2534  2540  2578  2580  2601
REPORT    650#
SCOPE     545#  1159  1203  1237  1274  1284  1374  1421  1487  1538  1575  1664
SETPRI    650#
SETTRA   2651#  2660  2661  2662  2663  2664  2666  2668  2669  2670  2671
SETUP     650#   840
SKIP      650#  1117  1166  1222  1260  1290  1405  1440  1522  1570  1645
SLASH     650#
SPACE     650#
STARS     650#   653   664   666   673   686   727   730  1027  1029  1118  1154  1156  1158  1188
         1199  1200  1202  1224  1233  1234  1236  1262  1270  1271  1273  1281  1283  1338  1370
         1371  1373  1407  1417  1418  1420  1473  1483  1484  1486  1524  1534  1535  1537  1552
         1561  1572  1574  1647  1654  1657  1694  1710  1746  1788  1800  1904  1990  2044  2091
         2170  2237  2314  2338  2341  2409  2438  2477  2530  2546  2573  2630  2673  2875
SWRSU     650#   863#
TRMTRP   2651#
TYPBIN    650#
TYPDEC    650#  1676
TYPNAM    650#   888
TYPNUM    650#
TYPOCS    650#
TYPOCT    650#  2056  2080  2359
TYPTXT    650#   936   963   996  1823  1835  1842  1851
$$CMRE    684#
$$CMTM    684#
$$ESCA    650#
$$NEWT    650#  1027  1156  1200  1234  1271  1281  1371  1418  1484  1535  1572
$$SET    2651#  2660  2661  2662  2663  2664  2666  2668  2669  2670  2671
$$SETM    879#
$$SKIP    650#  1117  1166  1222  1260  1290  1405  1440  1522  1570
.EQUAT    487#   540
.HEADE    487#   488
.SETTR    487#
.SETUP    487#   840
.SWRHI    487#   505
.SWRLO    516#
.TRMTR    487#
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.$APTB    728#
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CROSS REFERENCE TABLE

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