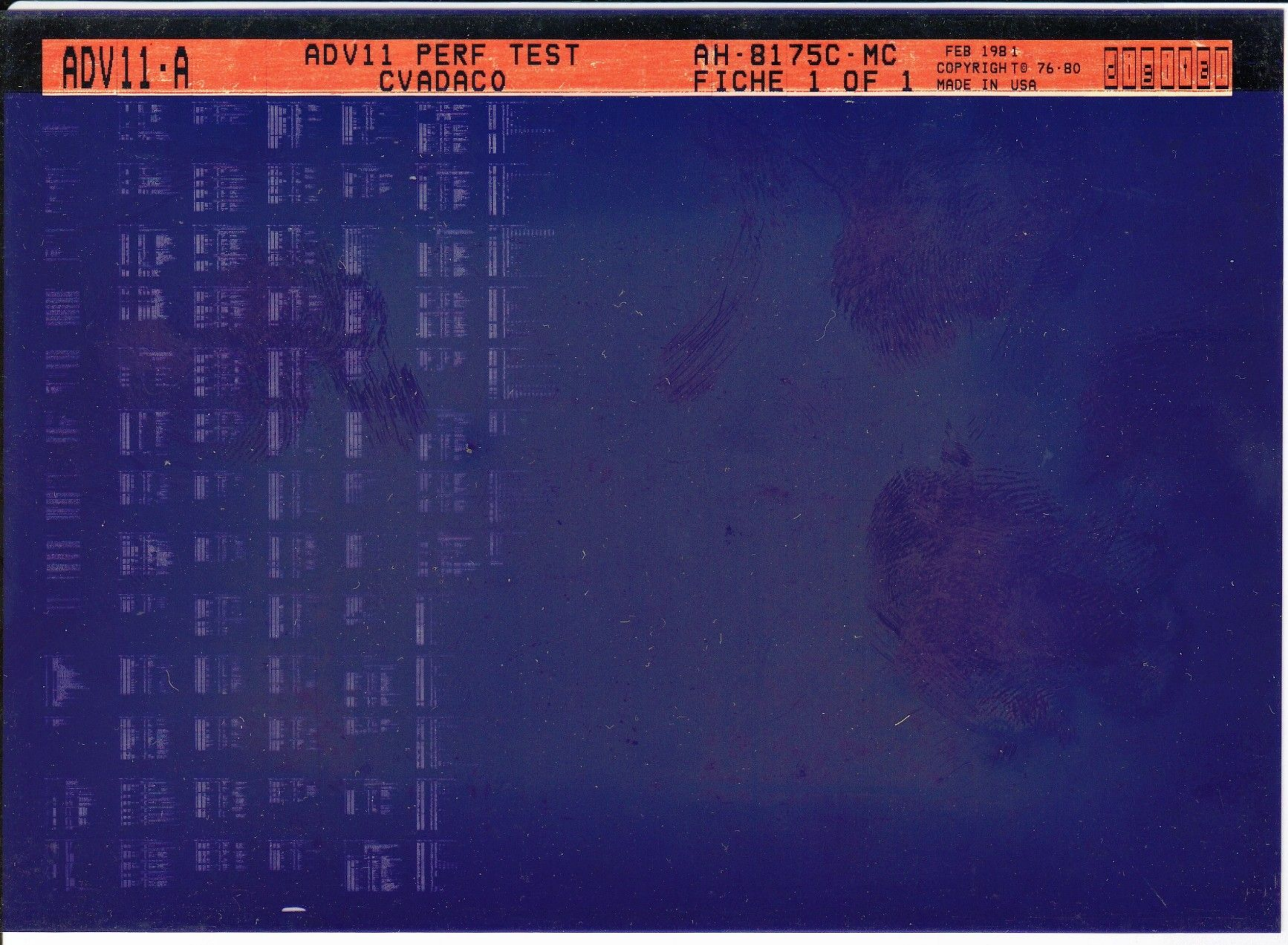
ADV11-A

ADV11 PERF TEST
CVADACO

AH-8175C-MC
FICHE 1 OF 1

FEB 1981

MADE IN USA



IDENTIFICATION

Product Code: AC-8174C-MC

Diagnostic Code: MAINDEC-11-CVADA-C

Product Name: CVADAC0 ADV11 Perf Test

Date: Aug. 8, 1980

Maintainer: Diagnostic Group

1.0 ABSTRACT

Version "C" includes the patch to correct an error in the differential linearity test. Version "C" also allows the program to execute properly on an "F-11" cpu.

This diagnostic has two starting addresses:

200 standard tolerances
204 restart
210 tighter tolerances for the option test area's burn in.

This diagnostic tests the ADV11 with or without the test connector.

When starting the diagnostic, a set of tests is listed and this statement is printed out: "Type the letter and carriage return of the desired test:". The following chart indicates which letter corresponds to which test:

W: The entire Wraparound test (requires test connector)

a. Analog subtests
b. Noise test
c. Interchannel Settling test
d. Differential Linearity and Relative Accuracy test

C: Calibration test only

P: Print values test only

L: Logic Subtests only

A: Auto test (requires test connector)

A. Logic subtests
ts B. Analog subtes
C. Noise Test
D. Interchannel Settling Test
E. Differential Linearity and Relative Accuracy Test

2.0 REQUIREMENTS

2.1 Equipment

LSI-11 or F-11 computer with 8K of memory
I/O Terminal
ADV11 Module
VT55 OR VT105 Terminal supported for graphic output (optional)
Test connector (70-12894)

2.2 Storage

This program uses ail 8K of memory and is not "chainable" on an 8K CPU. The program is "chainable" on 12K or greater CPU. The program will! destroy "absolute loader" on an 8K CPU, if "W" or "A" is selected.

3.0 LOADING PROCEDURE

Procedure for loading normal binary tapes should be followed.

4.0 STARTING PROCEDURE

4.1 Control Switch Settings

Standard PDP-11 Format

SW15=1 Halt on error
SW14=1 Loop on test
SW13=1 Inhibit error typeouts
SW12=1 Halt for VT55/VT105 GRAPHIC DISPLAY TERMINAL
SW11=1 Inhibit iterations
SW10=1 Bell on error
SW9 =1 Loop on error
SW8 =1 Loop on test in SWR <7:0>

Location 200 is the starting address of the diagnostic for standard tolerances. 204 is the restart address. 210 is the starting address of the diagnostic for the option test area's burn in test.

5.0 OPERATING PROCEDURE

Start the diagnostic at 200 or 210. The program heading and the list of tests available, will be printed out followed by a message "Type letter and <CR> for test:". Then type the letter you want, according to the table listed and depress return. If started at the option test area's starting address, the program will not ask for the test but will run the logic test.

Two control characters, ^A and ^C, are set aside for interrupting a test and transferring control to either the beginning of the diagnostic (^C) or to the beginning of the specific test which was in progress (^A). During the logic tests while a reset is being performed, ^C or ^A will not be executed until after the reset has been completed, therefore continue typing ^C or ^A until it is successful.

For machines without a hardware switch register, location SWREG (176) is used as a software switch register. To modify the contents of SWREG, type ^G. The program responds with the current contents of SWREG and a slash. Type the desired new contents of SWREG followed by a carriage return.

If "W" is typed, the program will type "XX ADV11's FOUND". Where XX is the number of ADV11's in octal. If the number is greater than 1, the test will be run successively on each ADV11. The program will run through the analog subtests, the Noise test, the Interchannel Settling test, and the Differential Linearity and Relative Accuracy test. The Test connector is required.

If "C" is typed, the program will run the calibration routine and loop on the test until it is calibrated and a carriage return typed. If a certain ADV11 is to be calibrated, its status register address must be loaded into $BASE (1250), and its vector address must be loaded into the low byte of $VECT1 (1244).

If "P" is typed, the program will run the print values routine and will loop on that test until the operator halts it. If a certain ADV11 is to be tested, its status register address must be loaded into $BASE (1250), and its vector address must be loaded into the low byte of $VECT1 (1244).

If "A" is typed, the program will execute the logic tests, analog tests, noise, settle and differential linearity. At the beginning of the test the program will type "XX ADV11'S FOUND". Where XX is the number of ADV11's in octal. If the number is greater than 1 the test will run successively on each ADV11.

If "L" is typed, the program will execute the logic tests, printing "END PASS" when it has completed an entire pass. At the beginning of the test the program will type "XX ADV11'S FOUND". Where XX is the number of ADV11's in octal. If the number is greater than 1, the test will be run successively on each ADV11.

5.1 Inhibiting Auto-Size Feature

This program will automatically auto-size and test each ADV11 it detects on the system. To inhibit this feature, set bit 15 of location $ENVM (1214). Also, load location $BASE (1250) with the ADV11's status register address and the low byte of location $VECT1 (1244) with the ADV11's vector address.

5.2 End of Pass Typeouts

At end of pass, the following typeout will occur:

```
"ENDPASS  GOOD UNITS  0000000000000011
```

This indicates that units 1 and 2 have run without failure.

6.0 ERRORS

This program uses the Diagnostic "SYSMAC" package for error reporting and typeout. The error information consists of the following:

```
ERRPC:     Location at which an error was detected.
STREG:     Address of the status register.
ADBUFF:    Address of the buffer
CHANL:     Channel value
NOMINAL:   Expected correct data
TOLERANCE:  The acceptable deviation from the nominal
ACTUAL:    Actual data
EXPECTED: Expected correct data
```

7.0 MISCELLANEOUS

7.1 Execution Time

Execution time for each of the tests is:

Calibration:	5 conversions/min @110 baud
Print Values:	8 conversions/8 seconds @ 110 baud
Wraparound Test:	7 minutes first pass; 25 minutes for successive passes
Logic Test:	1 minute
Auto Test:	8 minutes first pass, 26 minutes for successive passes

7.2 Status Register and Vector Addresses and Priority

When testing more than one ADV11, the difference in addresses is 4 for bus address and 10 for vector address. These values are in VADR (bus address) (1336) and VVCT (vector address) (1340). The first ADV11's status register address must be in $BASE (1250), its vector address must be in the low byte of $VECT1 (1244).

7.3 Switch Register

If a hardware switch register is present and the operator desires to use a software switch register and the ^G feature; it is necessary to load the starting address, set the hardware switch register to all ones (-1), and depress start. The program will then run with the software switch register.

7.4 VT55 Graphic Output

The screen display may be halted for examination by setting bit 12 of the switch register. Then, type "P" to complete the program's execution.

8.0 RESTRICTIONS

8.1 Testing

The Test Connector must be present when running the auto test and the wraparound test.

8.2 Starting Restriction

If a free-running clock, such as 60Hz from the power supply, is attached to the BEVNT bus line on both Rev level C/D and E systems, an interrupt to location 100 will occur when using the "G" and "L" commands prior to executing the first instruction. Therefore this program can not disable the BEVNT bus line by inhibiting interrupts.

User systems requiring a free-running clock attached to the BEVNT bus line can temporarily avoid this situation by setting the PSW(RS) to 200, instead of using the "G" command, load the PC (R7) with the starting address and use the proceed "P" command. Before using the "L" command, the PSW(RS) can be set to 200 to avoid receiving the BEVNT interrupt after loading the ABS loader.

8.3 Possible Program "BOMBS"

The first two tests of this program check to see if the ADV11 responds to the expected address. If the ADV11 does not respond, a buss error occurs. Also bus errors can occur during the time the program sizes to see how many ADV11's are on your system.

For more information on the next subject, see JAN. 1976 LSI-11 ENGINEERING BULLETIN issued by The Digital Components Group.

Bus errors may alter the preset contents of location 4 before the trap is executed, thereby transferring program control to area in the program that was not set up to handle the trap. If this happens, the program will "BOMB" and possibly rewrite parts of itself.

9.0 PROGRAM DESCRIPTION

9.1 Logic Tests

These 21 logic subtests run sequentially without further operator intervention. Its purpose is to check that each of the status register bits that are read/write can be loaded and properly read back; that initialize clears the external start enable bit, the done bit, the interrupt enable bit, the overflow bit, the error flag, and the A/D start bit. It also checks that the A/D done flag sets at end of conversion and clears when the converted value is read. It checks the interrupt logic and the correct setting of the error flag.

9.2 Calibration Routine

If "C" is typed, the program will ask for a channel. Type channel number followed by a carriage return. The program will ask you if you want offset or gain. Apply voltage requested to selected channel. Adjust pot requested for 0.00 LSB typeout. Type carriage return when adjusted. The last typeout will be checked for 0.00 LSB with a tolerance of 0.04 LSB if outside, the program will ask you to adjust the same pot again.

9.3 Print Values Routine

This test begins when the operator types "P". It then loads the channel from the switch register bits 0-7 and does a conversion on that channel. If SWR bit 13 is down (0), it prints out the converted value on the teletype; otherwise, if SWR bit 13 is up (1), it puts the converted value in the display register. The operator may change the channel at any time during the test, however the new values from the new channel will not be printed until the next line of 8 values is printed. The 8 values on each line correspond to only one channel.

9.4 Differential Linearity

This test determine if a change in the input voltage represents a similar change in the resulting converted binary value, by measuring the width of each state correct to 0.01 LSB.

9.5 Settling Test

The purpose of this test is to check that the time needed to settle and correctly report a new input value after switching channels does not exceed the expected amount of time for such a change.

9.6 Noise Test

This test measures the internal short-term repeatability noise within the A/D. RMS noise equals 1 standard deviation of the Gaussian curve, PEAK noise equals 2.3 standard deviation of the Gaussian curve.

9.7 Analog Tests

These 6 subtests check the channels and their output.

```
                                ;DEVELOPED USING SYSMAC.C3
                                .TITLE  MAINDEC-11-CVADA-C
                                ;*COPYRIGHT (C) 1980
                                ;*DIGITAL EQUIPMENT CORP.
                                ;*MAYNARD, MASS. 01754
                                ;*
                                ;*PROGRAM BY G. STEVENS MOD. R.SHOOP
                                ;*
                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
                                ;*
                                .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
```

```
(1)             010000                  SW12=   10000
(1)             004000                  SW11=   4000
(1)             002000                  SW10=   2000
(1)             001000                  SW09=   1000
(1)             000400                  SW08=   400
(1)             000200                  SW07=   200
(1)             000100                  SW06=   100
(1)             000040                  SW05=   40
(1)             000020                  SW04=   20
(1)             000010                  SW03=   10
(1)             000004                  SW02=   4
(1)             000002                  SW01=   2
(1)             000001                  SW00=   1
(1)                                     .EQUIV  SW09,SW9
(1)                                     .EQUIV  SW08,SW8
(1)                                     .EQUIV  SW07,SW7
(1)                                     .EQUIV  SW06,SW6
(1)                                     .EQUIV  SW05,SW5
(1)                                     .EQUIV  SW04,SW4
(1)                                     .EQUIV  SW03,SW3
(1)                                     .EQUIV  SW02,SW2
(1)                                     .EQUIV  SW01,SW1
(1)                                     .EQUIV  SW00,SW0
(1)
(1)                                     ;*DATA BIT DEFINITIONS (BIT00 TO BIT15)
(1)             100000                  BIT15=  100000
(1)             040000                  BIT14=  40000
(1)             020000                  BIT13=  20000
(1)             010000                  BIT12=  10000
(1)             004000                  BIT11=  4000
(1)             002000                  BIT10=  2000
(1)             001000                  BIT09=  1000
(1)             000400                  BIT08=  400
(1)             000200                  BIT07=  200
(1)             000100                  BIT06=  100
(1)             000040                  BIT05=  40
(1)             000020                  BIT04=  20
(1)             000010                  BIT03=  10
(1)             000004                  BIT02=  4
(1)             000002                  BIT01=  2
(1)             000001                  BIT00=  1
(1)                                     .EQUIV  BIT09,BIT9
(1)                                     .EQUIV  BIT08,BIT8
(1)                                     .EQUIV  BIT07,BIT7
(1)                                     .EQUIV  BIT06,BIT6
(1)                                     .EQUIV  BIT05,BIT5
(1)                                     .EQUIV  BIT04,BIT4
(1)                                     .EQUIV  BIT03,BIT3
(1)                                     .EQUIV  BIT02,BIT2
(1)                                     .EQUIV  BIT01,BIT1
(1)                                     .EQUIV  BIT00,BIT0
(1)
(1)                                     ;*BASIC "CPU" TRAP VECTOR ADDRESSES
(1)             000004                  ERRVEC= 4               ;;TIME OUT AND OTHER ERRORS
(1)             000010                  RESVEC= 10              ;;RESERVED AND ILLEGAL INSTRUCTIONS
(1)             000014                  TBITVEC=14              ;;"T" BIT
```

```
(1)          000014                  TRTVEC= 14              ;;TRACE TRAP
(1)          000014                  BPTVEC= 14              ;;BREAKPOINT TRAP (BPT)
(1)          000020                  IOTVEC= 20              ;;INPUT/OUTPUT TRAP (IOT) **SCOPE**
(1)          000024                  PWRVEC= 24              ;;POWER FAIL
(1)          000030                  EMTVEC= 30              ;;EMULATOR TRAP (EMT) **ERROR**
(1)          000034                  TRAPVEC=34              ;;"TRAP" TRAP
(1)          000060                  TKVEC=  60              ;;TTY KEYBOARD VECTOR
(1)          000064                  TPVEC=  64              ;;TTY PRINTER VECTOR
(1)          000240                  PIRQVEC=240             ;;PROGRAM INTERRUPT REQUEST VECTOR
 23                                  .SBTTL  OPERATIONAL SWITCH SETTINGS
(1)                                  ;*
(1)                                  ;*      SWITCH              USE
(1)                                  ;*      ------          --------------------
(1)                                  ;*        15            HALT ON ERROR
(1)                                  ;*        14            LOOP ON TEST
(1)                                  ;*        13            INHIBIT ERROR TYPEOUTS
(1)                                  ;*        12            HALT FOR VT55 DISPLAY
(1)                                  ;*        11            INHIBIT ITERATIONS
(1)                                  ;*        10            BELL ON ERROR
(1)                                  ;*         9            LOOP ON ERROR
(1)                                  ;*         8            LOOP ON TEST IN SWR<7:0>
 24          170400                  ABASE=  170400
 25          100400                  AVECT1= 100400
 26          000200                  APRIOR= 200
 27
 28          000100                          .=100
 29  000100  000104  000200  000002          .WORD   104,200,2
 30
 31                                  .SBTTL  TRAP CATCHER
(1)
(1)          000000                          .=0
(1)                                  ;*ALL UNUSED LOCATIONS FROM 4 - 776 CONTAIN A ".+2,HALT"
(1)                                  ;*SEQUENCE TO CATCH ILLEGAL TRAPS AND INTERRUPTS
(1)                                  ;*LOCATION 0 CONTAINS 0 TO CATCH IMPROPERLY LOADED VECTORS
(1)          000174                          .=174
(1)  000174  000000                  DISPREG: .WORD  0               ;;SOFTWARE DISPLAY REGISTER
(1)  000176  000000                  SWREG:   .WORD  0               ;;SOFTWARE SWITCH REGISTER
(1)                                  .SBTTL  STARTING ADDRESS(ES)
(1)  000200  000137  001644                  JMP     @#BEG1  ;;JUMP TO STARTING ADDRESS OF PROGRAM
 32  000204  000137  002262                  JMP     @#BEG2          ;RESTART ADDRESS
 33  000210  000137  001652                  JMP     @#BEGIN2                ;START ADDRESS FOR OPTION TEST AREA
```

```
                                .SBTTL  ACT11 HOOKS

                                ;;**********************************************************************
                                ;HOOKS REQUIRED BY ACT11
                                        $SVPC=.                 ;SAVE PC
000214                                  .=46
000046                                  $ENDAD                  ;;1)SET LOC.46 TO ADDRESS OF $ENDAD IN .$EOP
000046  012022                          .=52
000052                                  .WORD   0               ;;2)SET LOC.52 TO ZERO
000052  000000                          .=$SVPC                 ;; RESTORE PC
000214
001000                          .=1000
                                .SBTTL  APT PARAMETER BLOCK

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

001000                          $APTHD:
001000  000000                  $HIBTS: .WORD   0       ;;TWO HIGH BITS OF 18 BIT MAILBOX ADDR.
001002  001174                  $MBADR: .WORD   $MAIL   ;;ADDRESS OF APT MAILBOX (BITS 0-15)
001004  000454                  $TSTM:  .WORD   300.    ;;RUN TIM OF LONGEST TEST
001006  000074                  $PASTM: .WORD   60.     ;;RUN TIME IN SECS. OF 1ST PASS ON 1 UNIT (QUICK VERIFY)
001010  000454                  $UNITM: .WORD   300.    ;;ADDITIONAL RUN TIME (SECS) OF A PASS FOR EACH ADDITIONAL UNIT
001012  000031                          .WORD   $ETEND-$MAIL/2 ;;LENGTH MAILBOX-ETABLE(WORDS)
```

```
                        .SBTTL  COMMON TAGS

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

                                .=1100
001100                  $CMTAG:                         ;;START OF COMMON TAGS
001100  000000                  .WORD   0
001102  000             $TSTNM: .BYTE   0               ;;CONTAINS THE TEST NUMBER
001103  000             $ERFLG: .BYTE   0               ;;CONTAINS ERROR FLAG
001104  000000          $ICNT:  .WORD   0               ;;CONTAINS SUBTEST ITERATION COUNT
001106  000000          $LPADR: .WORD   0               ;;CONTAINS SCOPE LOOP ADDRESS
001110  000000          $LPERR: .WORD   0               ;;CONTAINS SCOPE RETURN FOR ERRORS
001112  000000          $ERTTL: .WORD   0               ;;CONTAINS TOTAL ERRORS DETECTED
001114  000             $ITEMB: .BYTE   0               ;;CONTAINS ITEM CONTROL BYTE
001115  001             $ERMAX: .BYTE   1               ;;CONTAINS MAX. ERRORS PER TEST
001116  000000          $ERRPC: .WORD   0               ;;CONTAINS PC OF LAST ERROR INSTRUCTION
001120  000000          $GDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'GOOD' DATA
001122  000000          $BDADR: .WORD   0               ;;CONTAINS ADDRESS OF 'BAD' DATA
001124  000000          $GDDAT: .WORD   0               ;;CONTAINS 'GOOD' DATA
001126  000000          $BDDAT: .WORD   0               ;;CONTAINS 'BAD' DATA
001130  000000                  .WORD   0               ;;RESERVED--NOT TO BE USED
001132  000000                  .WORD   0
001134  000             $AUTOB: .BYTE   0               ;;AUTOMATIC MODE INDICATOR
001135  000             $INTAG: .BYTE   0               ;;INTERRUPT MODE INDICATOR
001136  000000                  .WORD   0
001140  177570          SWR:    .WORD   DSWR            ;;ADDRESS OF SWITCH REGISTER
001142  177570          DISPLAY: .WORD  DDISP           ;;ADDRESS OF DISPLAY REGISTER
001144  177560          $TKS:   177560                  ;;TTY KBD STATUS
001146  177562          $TKB:   177562                  ;;TTY KBD BUFFER
001150  177564          $TPS:   177564                  ;;TTY PRINTER STATUS REG. ADDRESS
001152  177566          $TPB:   177566                  ;;TTY PRINTER BUFFER REG. ADDRESS
001154  000             $NULL:  .BYTE   0               ;;CONTAINS NULL CHARACTER FOR FILLS
001155  002             $FILLS: .BYTE   2               ;;CONTAINS # OF FILLER CHARACTERS REQUIRED
001156  012             $FILLC: .BYTE   12              ;;INSERT FILL CHARS. AFTER A "LINE FEED"
001157  000             $TPFLG: .BYTE   0               ;;"TERMINAL AVAILABLE" FLAG (BIT<07>=0=YES)
001160  000000          $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          $UNIT:  .WORD   AUNIT           ;;I/O UNIT NUMBER
001210  000000          $MSGAD: .WORD   AMSGAD          ;;MESSAGE ADDRESS
```

```
    (2)  001212  000000                $MSGLG: .WORD   AMSGLG  ;;MESSAGE LENGTH
    (2)  001214                        $ETABLE:                ;;APT ENVIRONMENT TABLE
    (2)  001214     000                $ENV:   .BYTE   AENV    ;;ENVIRONMENT BYTE
    (2)  001215     000                $ENVM:  .BYTE   AENVM   ;;ENVIRONMENT MODE BITS
    (2)  001216  000000                $SWREG: .WORD   ASWREG  ;;APT SWITCH REGISTER
    (2)  001220  000000                $USWR:  .WORD   AUSWR   ;;USER SWITCHES
    (2)  001222  000000                $CPUOP: .WORD   ACPUOP  ;;CPU TYPE,OPTIONS
    (2)                                ;*                      BITS 15-11=CPU TYPE
    (2)                                ;*                              11/04=01,11/05=02,11/20=03,11/40=04,11/45=05
    (2)                                ;*                              11/70=06,PDQ=07,Q=10
    (2)                                ;*                      BIT 10=REAL TIME CLOCK
    (2)                                ;*                      BIT  9=FLOATING POINT PROCESSOR
    (2)                                ;*                      BIT  8=MEMORY MANAGEMENT
    (2)  001224     000                $MAMS1: .BYTE   AMAMS1  ;;HIGH ADDRESS,M.S. BYTE
    (2)  001225     000                $MTYP1: .BYTE   AMTYP1  ;;MEM. TYPE,BLK#1
    (2)                                ;*                      MEM.TYPE BYTE   --  (HIGH BYTE)
    (2)                                ;*                              900 NSEC CORE=001
    (2)                                ;*                              300 NSEC BIPOLAR=002
    (2)                                ;*                              500 NSEC MOS=003
    (2)  001226  000000                $MADR1: .WORD   AMADR1  ;;HIGH ADDRESS,BLK#1
    (2)                                ;*                        MEM.LAST ADDR.=3 BYTES,THIS WORD AND LOW OF "TYPE" ABOVE
    (2)  001230     000                $MAMS2: .BYTE   AMAMS2  ;;HIGH ADDRESS,M.S. BYTE
    (2)  001231     000                $MTYP2: .BYTE   AMTYP2  ;;MEM.TYPE,BLK#2
    (2)  001232  000000                $MADR2: .WORD   AMADR2  ;;MEM.LAST ADDRESS,BLK#2
    (2)  001234     000                $MAMS3: .BYTE   AMAMS3  ;;HIGH ADDRESS,M.S.BYTE
    (2)  001235     000                $MTYP3: .BYTE   AMTYP3  ;;MEM.TYPE,BLK#3
    (2)  001236  000000                $MADR3: .WORD   AMADR3  ;;MEM.LAST ADDRESS,BLK#3
    (2)  001240     000                $MAMS4: .BYTE   AMAMS4  ;;HIGH ADDRESS,M.S.BYTE
    (2)  001241     000                $MTYP4: .BYTE   AMTYP4  ;;MEM.TYPE,BLK#4
    (2)  001242  000000                $MADR4: .WORD   AMADR4  ;;MEM.LAST ADDRESS,BLK#4
    (2)  001244  100400                $VECT1: .WORD   AVECT1  ;;INTERRUPT VECTOR#1,BUS PRIORITY#1
    (2)  001246  000000                $VECT2: .WORD   AVECT2  ;;INTERRUPT VECTOR#2BUS PRIORITY#2
    (2)  001250  170400                $BASE:  .WORD   ABASE   ;;BASE ADDRESS OF EQUIPMENT UNDER TEST
    (2)  001252  000000                $DEVM:  .WORD   ADEVM   ;;DEVICE MAP
    (2)  001254  000000                $CDW1:  .WORD   ACDW1   ;;CONTROLLER DESCRIPTION WORD#1
    (2)  001256                        $ETEND:
    (2)                                .MEXIT
```

```
(1)                                 .SBTTL  ERROR POINTER TABLE
(1)
(1)                                 ;*THIS TABLE CONTAINS THE INFORMATION FOR EACH ERROR THAT CAN OCCUR.
(1)                                 ;*THE INFORMATION IS OBTAINED BY USING THE INDEX NUMBER FOUND IN
(1)                                 ;*LOCATION $ITEMB. THIS NUMBER INDICATES WHICH ITEM IN THE TABLE IS PERTINENT.
(1)                                 ;*NOTE1:        IF $ITEMB IS 0 THE ONLY PERTINENT DATA IS ($ERRPC).
(1)                                 ;*NOTE2:        EACH ITEM IN THE TABLE CONTAINS 4 POINTERS EXPLAINED AS FOLLOWS:
(1)
(1)                                 ;*      EM              ;;POINTS TO THE ERROR MESSAGE
(1)                                 ;*      DH              ;;POINTS TO THE DATA HEADER
(1)                                 ;*      DT              ;;POINTS TO THE DATA
(1)                                 ;*      DF              ;;POINTS TO THE DATA FORMAT
(1)
(1)
(1)  001256                         $ERRTB:
 40
 41
 42
 51                                 ;ITEM   1
 52  001256  014325                         EM1                     ;STATUS REG. ERROR
 53  001260  014445                         DH1                     ;ERRPC STREG EXPECTED ACTUAL
 54  001262  014624                         DT1                     ;$ERRPC, STREG, $GDDAT, $BDDAT
 55  001264  014664                         DF1
 56
 57
 58                                 ;ITEM   2
 59  001266  014347                         EM2                     ;FAILED TO INTERRUPT
 60  001270  014564                         DH3                     ;ERRPC STREG ACTUAL
 61  001272  014654                         DT3                     ;$ERRPC, STREG,  $BDDAT
 62  001274  014664                         DF1
 63
 64                                 ;ITEM   3
 65  001276  014373                         EM3                     ;UNEXPECTED INTERRUPT
 66  001300  014564                         DH3                     ;ERRPC STREG
 67  001302  014654                         DT3                     ;$ERRPC, STREG
 68  001304  014664                         DF1
 69
 70                                 ;ITEM   4
 71  001306  014420                         EM4                     ;ERROR ON A/D CHANNEL
 72  001310  014501                         DH2                     ;ERRPC  STREG  CHAN  NOMINAL  TOL  ACTUAL
 73  001312  014636                         DT2                     ;$ERRPC,STREG,CHANL,$GDDAT,SPREAD,$BDDAT
 74  001314  014664                         DF1
```

```
                                .SBTTL      MISCELLANEOUS, TEMPORARY, AND STORAGE LOCATIONS
001316  170400                  STREG:  ABASE                   ;ADDRESS OF STATUS REGISTER
001320  170401                  ADST1:  ABASE+1                 ;UPPER BYTE OF STATUS REG.
001322  170402                  ADBUFF: ABASE+2                 ;ADDRESS OF A/D BUFFER
001324  100400                  VECTOR: AVECT1                  ;VECTOR ADDRESS
001326  000200                  BASEBR: APRIOR                  ;INTERRUPT PRIORITY LEVEL
001330  100402                  VECTR1: AVECT1+2
001332  100404                  VECTR2: AVECT1+4                ;ERROR VECTOR ADDRESS
001334  100406                  VECTR3: AVECT1+6
001336  000004                  VADR:   4                       ;INCREMENT FOR BUS ADDRESS
001340  000010                  VVCT:   10                      ;INCREMENT FOR VECTOR ADDRESS
001342  000000                  BASECH: 0                       ;BASE CHANNEL
001344  000060                  KBVECT: 60
001346  000000                  WIDE:   0                       ;NO. OF WIDE STATES
001350  000000                  NARROW: 0                       ;NO. OF NARROW STATES
001352  000000                  FIRST:  0
001354  000000                  SKIPST: 0                       ;NO. OF SKIPPED STATES
001356  000000                  TEMP:   0                       ;WORK AREA
001360  000000                  CH1:    0                       ;FIRST CHANNEL
001362  000000                  CH2:    0                       ;SECOND CHANNEL
001364  000000                  NBEXT:  0                       ;NO. OF ADV11'S TO BE TESTED
001366  000000                  NMBEXT: 0                       ;NO. OF ADV11'S TO BE TESTED
001370  000000                  DUMMY:  0                       ;DUMMY CHANNEL
001372  000000                  CHANL:  0                       ;CHANNEL VALUE
001374  000000                  TADDR:  0                       ;TEST ADDRESS
001376  000000                  RNA:    0                       ;RANDOM
001400  000000                  RNB:    0                       ;NUMBER
001402  000000                  RNC:    0                       ;VALUES
001404  000000                  RMS:    0                       ;RMS NOISE VALUE
001406  000000                  PEAK:   0                       ;PEAK NOISE VALUE
001410  000000                  FLAG:   0                       ;VT55 FLAG
001412  000000                  SPREAD: 0                       ;DEVIATION FROM THE NOMINAL
001414  000000                  DAC:    0                       ;SAR VALUE
001416  000000                  DELAY:  0                       ;TIME DELAY COUNTER
001420  000000                  EDGE:   0                       ;EDGE VALUE
001422  000000                  BITPNT: 0
001424  000000                  MIN:    0                       ;MIN VALUE
001426  000000                  WFTEST: 0                       ;OPTION TEST AREA FLAG
001430  000000                  MAX:    0                       ;MAX VALUE
001432  000000                  PERCNT: 0                       ;PERCENT FOR SAR ROUTINE
001434  000000                  OUT:    0
001436  000000                  GUNITS: 0
001440  000001                  TSTBIT: 1

001442                          UNEXP:
(1) 001442  012737  001456  001162          MOV     #1$,$ESCAPE     ;;ESCAPE TO 1$ ON ERROR
001450  005237  001103                      INC     $ERFLG
001454  104003                              ERROR   3
001456  005037  001162          1$:         CLR     $ESCAPE         ;RETURN ESCAPE TO NORMAL
001462  000002                              RTI                     ;UNEXPECTED INTERRUPT
```

```
                                                .SBTTL      CONTROL A AND C DECODERS
001464  010046                                  ISERV:  MOV     R0,-(SP)                ;SAVE R0
001466  017700  177454                                  MOV     @$TKB,R0                ;GET CHARACTER
001472  042700  177600                                  BIC     #177600,R0
001476  120027  000003                                  CMPB    R0,#3                   ;IS IT ^C?
001502  001010                                          BNE     1$
001504  104401  012114                                  TYPE    ,CMSG                   ;ECHO CHARACTER
001510  012706  001100                                  MOV     #STACK,SP
001514  004737  011356                                  JSR     PC,RST                  ;RESET & SET INTRPT. EN.
001520  000137  002262                                  JMP     BEG2
001524  120027  000001                          1$:     CMPB    R0,#1                   ;IS IT ^A?
001530  001010                                          BNE     2$
001532  104401  012107                                  TYPE    ,AMSG                   ;ECHO CHARACTER
001536  012706  001100                                  MOV     #STACK,SP
001542  004737  011356                                  JSR     PC,RST                  ;RESET & SET INTRPT. EN.
001546  000177  177622                                  JMP     @TADDR                  ;RETURN TO TEST
001552  120027  000007                          2$:     CMPB    R0,#7                   ;IS IT ^G?
001556  001027                                          BNE     NONE
001560  023727  001140  177570                          CMP     SWR,#177570             ;HARDWARE SWREG?
001566  001423                                          BEQ     NONE
001570  104401  012121                                  TYPE    ,GMSG                   ;ECHO CHARACTER
001574  017746  177340                                  MOV     @SWR,-(SP)      ;;SAVE @SWR FOR TYPEOUT
(1)                                                     ;;TYPE SWREG
(1)     001600  104403                                  TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)     001602     006                                  .BYTE   6               ;;TYPE 6 DIGITS
(1)     001603     001                                  .BYTE   1               ;;TYPE LEADING ZEROS
001604  104401  012301                                  TYPE    ,SLASH
001610  104410                                          RDOCT                   ;READ NEW VALUE
001612  012677  177322                                  MOV     (SP)+,@SWR      ;LOAD NEW SWREG VALUE
001616  012600                                  POPR0:  MOV     (SP)+,R0
001620  022776  000001  000000                  RETURN: CMP     #1,@0(SP)       ;DOES IT RETURN TO A WAIT?
001626  001002                                          BNE     RET2            ;NO
001630  062716  000002                          RET1:   ADD     #2,(SP)         ;BUMP RETURN ADDRESS
001634  000002                                  RET2:   RTI
001636  104401  012105                          NONE:   TYPE    ,QUEST                  ;TYPE ''?''
001642  000765                                          BR      POPR0
```

```
                                        .SBTTL          INITIAL START-UP,HOUSEKEEPING, AND DIALOGUE
001644  005037  001426          BEGIN:  CLR     WFTEST
001650  000403                          BR      RBEG
001652  012737  000001  001426  BEGIN2: MOV     #1,WFTEST
001660  000005                  RBEG:   RESET
                                        .SBTTL  INITIALIZE THE COMMON TAGS
(1)                                     ;;CLEAR THE COMMON TAGS ($CMTAG) AREA
(1)     001662  012706  001100          MOV     #$CMTAG,R6      ;;FIRST LOCATION TO BE CLEARED
(1)     001666  005026                  CLR     (R6)+           ;;CLEAR MEMORY LOCATION
(1)     001670  022706  001140          CMP     #SWR,R6 ;;DONE?
(1)     001674  001374                  BNE     .-6             ;;LOOP BACK IF NO
(1)     001676  012706  001100          MOV     #STACK,SP       ;;SETUP THE STACK POINTER
(1)                                     ;;INITIALIZE A FEW VECTORS
(1)     001702  012737  015262  000020  MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
(1)     001710  012737  000340  000022  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
(1)     001716  012737  015540  000030  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
(1)     001724  012737  000340  000032  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
(1)     001732  012737  017130  000034  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
(1)     001740  012737  000340  000036  MOV     #340,@#TRAPVEC+2;LEVEL 7
(1)     001746  013737  011742  011734  MOV     $ENDCT,$EOPCT   ;;SETUP END-OF-PROGRAM COUNTER
(1)     001754  005037  001160          CLR     $TIMES          ;;INITIALIZE NUMBER OF ITERATIONS
(1)     001760  005037  001162          CLR     $ESCAPE         ;;CLEAR THE ESCAPE ON ERROR ADDRESS
(1)     001764  112737  000001  001115  MOVB    #1,$ERMAX       ;;ALLOW ONE ERROR PER TEST
(1)     001772  012737  001772  001106  MOV     #.,$LPADR       ;;INITIALIZE THE LOOP ADDRESS FOR SCOPE
(1)     002000  012737  002000  001110  MOV     #.,$LPERR       ;;SETUP THE ERROR LOOP ADDRESS
(2)                                     ;;SIZE FOR A HARDWARE SWITCH REGISTER. IF NOT FOUND OR IT IS
(2)                                     ;;EQUAL TO A "-1", SETUP FOR A SOFTWARE SWITCH REGISTER.
(2)     002006  013746  000004          MOV     @#ERRVEC,-(SP)  ;;SAVE ERROR VECTOR
(2)     002012  012737  002046  000004  MOV     #64$,@#ERRVEC   ;;SET UP ERROR VECTOR
(2)     002020  012737  177570  001140  MOV     #DSWR,SWR       ;;SETUP FOR A HARDWARE SWICH REGISTER
(2)     002026  012737  177570  001142  MOV     #DDISP,DISPLAY  ;;AND A HARDWARE DISPLAY REGISTER
(2)     002034  022777  177777  177076  CMP     #-1,@SWR        ;;TRY TO REFERENCE HARDWARE SWR
(2)     002042  001012                  BNE     66$             ;;BRANCH IF NO TIMEOUT TRAP OCCURRED
(2)                                                             ;;AND  THE HARDWARE SWR IS NOT = -1
(2)     002044  000403                  BR      65$             ;;BRANCH IF NO TIMEOUT
(2)     002046  012716  002054  64$:    MOV     #65$,(SP)       ;;SET UP FOR TRAP RETURN
(2)     002052  000002                  RTI
(2)     002054  012737  000176  001140  65$:    MOV     #SWREG,SWR      ;;POINT TO SOFTWARE SWR
(2)     002062  012737  000174  001142          MOV     #DISPREG,DISPLAY
(2)     002070  012637  000004  66$:    MOV     (SP)+,@#ERRVEC  ;;RESTORE ERROR VECTOR
(1)
(2)     002074  005037  001202          CLR     $PASS           ;;CLEAR PASS COUNT
(2)     002100  132737  000200  001215  BITB    #APTSIZE,$ENVM  ;;TEST USER SIZE UNDER APT
(2)     002106  001403                  BEQ     67$             ;;YES,USE NON-APT SWITCH
(2)     002110  012737  001216  001140  MOV     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
(2)     002116                  67$:
```

```
   166  002116  005037  001410                  CLR     FLAG            ;CLEAR VT55 FLAG
   167  002122  005737  000042                  TST     @#42                    ;IS IT CHAINED?
   168  002126  001033                          BNE     REST1
   169                                  .SBTTL          DETERMINE IF VT55 TYPE TERMINAL IS PRESENT
   170  002130  042777  000100  177006          BIC     #100,@$TKS
   171  002136  104401  014002                  TYPE    ,C0             ;TYPE ASCIZ STRING
   172  002142  004737  002432                  JSR     PC,VTFLG        ;GET A CHARACTER
   173  002146  020027  000033                  CMP     R0,#33
   174  002152  001017                          BNE     NOVT55          ;NO VT55 PRESENT
   175  002154  004737  002432                  JSR     PC,VTFLG        ;GET A CHARACTER
   176  002160  020027  000057                  CMP     R0,#57
   177  002164  001012                          BNE     NOVT55          ;NO VT55 PRESENT
   178  002166  004737  002432                  JSR     PC,VTFLG        ;GET A CHARACTER
   179  002172  020027  000103                  CMP     R0,#103
   180  002176  001403                          BEQ     VT55            ;VT55 IS PRESENT
   181  002200  020027  000105                  CMP     R0,#105
   182  002204  001002                          BNE     NOVT55
   183  002206  005237  001410          VT55:   INC     FLAG
```

```
                                        .SBTTL      DIALOGUE TO DETERMINE WHICH TEST TO RUN
002212  104401  014145                  NOVT55: TYPE    ,HEAD1
002216  000005                          REST1:  RESET
002220  004737  006344                          JSR     PC,FIXONE               ;INITIALIZE ADDRESSES
002224  013700  001344                          MOV     KBVECT,R0
002230  012720  001464                          MOV     #ISERV,(R0)+
002234  012710  000340                          MOV     #340,(R0)
002240  012737  062341  001376                  MOV     #62341,RNA              ;RANDOM NO, VARIABLES
002246  012737  142315  001400                  MOV     #142315,RNB
002254  012737  127623  001402                  MOV     #127623,RNC
002262  012706  001100                  BEG2:   MOV     #STACK,SP       ;RESET STACK POINTER INCASE RESTARTED
002266  000005                                  RESET                   ;RESTART ADDRESS
002270  005737  000042                          TST     @#42                    ;IS IT CHAINED?
002274  001405                                  BEQ     1$
002276  000137  006064                  2$:     JMP     BEGL                    ;GO TO LOGIC TESTS
002302  005737  001426                          TST     WFTEST                  ;TEST FOR OPTION TEST
002306  001373                                  BNE     2$              ;;
002310  104401  013617                  1$:     TYPE    ,MSG71
002314  104407                          TRYAG:  RDLIN
002316  052777  000100  176620                  BIS     #100,@$TKS
002324  005046                                  CLR     -(SP)                   ;CLEAR PSW
002326  012746  002334                          MOV     #1$,-(SP)
002332  000002                                  RTI
002334  012600                          1$:     MOV     (SP)+,R0                ;READ ANSWER
002336  142710  000040                          BICB    #40,(R0)
002342  121027  000101                          CMPB    (R0),#'A                ;IS IT A?
002346  001002                                  BNE     2$              ;;NO, TRY C
002350  000137  006122                          JMP     BEGINA                  ;GO TO AUTO TEST
002354  121027  000103                  2$:     CMPB    (R0),#'C                ;IS IT C?
002360  001002                                  BNE     3$              ;;NO, TRY P
002362  000137  005420                          JMP     BEGINC                  ;GO TO CALIBRATION TEST
002366  121027  000120                  3$:     CMPB    (R0),#'P                ;IS IT P?
002372  001002                                  BNE     4$              ;;NO, TRY L
002374  000137  005674                          JMP     BEGINP                  ;GO TO DISPLAY CONVERSIONS TEST
002400  121027  000114                  4$:     CMPB    (R0),#'L                ;IS IT L?
002404  001002                                  BNE     5$              ;;NO, TRY W
002406  000137  006064                          JMP     BEGL                    ;GO TO LOGIC TESTS
002412  121027  000127                  5$:     CMPB    (R0),#'W                ;IS IT W?
002416  001002                                  BNE     6$              ;;NO,TRY AGAIN
002420  000137  006204                          JMP     BEGINW                  ;GO TO WRAPAROUND TEST
002424  104401  012105                  6$:     TYPE    ,QUEST
002430  000731                                  BR      TRYAG                   ;WAIT FOR CHARACTER
```

```
                                VTFLG:  CLR     R0              ;TEST FOR PRESENCE
                                1$:     TSTB    @$TKS           ;OF VT55
                                        BMI     2$              ;;VT55 RESPONDS WITH <33><57>[<103> OR <105>]
                                        DEC     R0
                                        BNE     1$              ;;
                                        TST     (SP)+           ;POP A WORD OFF STACK
                                        BR      NOVT55          ;;NO VT55 PRESENT
                                2$:     MOV     @$TKB,R0
                                        BIC     #177600,R0              ;TEST VT55 CODE
                                        RTS     PC

                                TESTAD: CLR     $PASS           ;CLEAR PASS COUNT
                                        CLR     GUNITS          ;CLEAR UNIT ERROR BITS
                                        MOV     #1,TSTBIT       ;INITIALIZE MODULE ERROR TEST BIT
                                        MOV     #1,TEMP         ;SET UP FOR ONLY ONE A/D
                                        TSTB    $ENVM           ;TESTING ONLY ONE A/D?
                                        BMI     3$              ;;YES
                                        MOV     #4,TEMP         ;SET UP MAX NO OF A/D'S
                                        TST     WFTEST          ;IS IT IN OPTION TEST
                                        BEQ     3$              ;;NOT IN OPTION TEST
                                        MOV     #16.,TEMP       ;SET UP OPTION MAX NO OF A/D'S
                                3$:     MOV     $BASE,$BDDAT    ;SETUP TO TEST FOR ADV11'S
                                        MOV     @#ERRVEC,-(SP)  ;SAVE ERRVEC
                                        MOV     #2$,ERRVEC      ;SET UP FOR TIME OUT ERROR
                                        CLR     NBEXT           ;CLEAR ADV11 COUNTER
                                1$:     TST     @$BDDAT         ;ADDRESS ADV11
                                        INC     NBEXT           ;INCREMENT ADV11 COUNTER
                                        BIS     TSTBIT,GUNITS   ;SET A/D BIT UNDER TEST
                                        ASL     TSTBIT          ;SET TEST BIT FOR NEXT UNIT
                                        DEC     TEMP            ;REACHED MAX?
                                        BEQ     4$              ;;REACHED MAX NO OF A/D'S
                                        ADD     VADR,$BDDAT     ;GET NEXT ADV11
                                        BR      1$              ;;TRY NEXT ADV11
                                2$:     CMP     (SP)+,(SP)+     ;POP 2 WORDS OFF STACK
                                4$:
(1)                                     MOV     NBEXT,-(SP)     ;;SAVE NBEXT FOR TYPEOUT
(1)                                                             ;;TYPE NUMBER OF ADV11'S
(1)                                     TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)                                     .BYTE   2               ;;TYPE 2 DIGIT(S)
(1)                                     .BYTE   0               ;;SUPPRESS LEADING ZEROS
                                        TYPE    ,MSG50
                                        DEC     NBEXT           ;ADJUST ADV11 COUNT
                                        MOV     NBEXT,NMBEXT    ;KEEP COUNT OF NUMBER
                                        MOV     (SP)+,ERRVEC    ;RESTORE ERRVEC
                                        MOV     #1,TSTBIT       ;INITIALIZE MODULE ERROR TEST BIT
                                        RTS     PC
```

```
                                BEGINL:
                                ;;*******************************************************************
                                ;*TEST 1         FLOAT A ONE THRU MULTIPLEXER BITS
                                ;;*******************************************************************
002670  012737  002670  001106 TST1:   MOV     #TST1,$LPADR
002676  012737  002670  001110         MOV     #TST1,$LPERR
002704  012737  000400  001124         MOV     #BIT8,$GDDAT            ;LOAD FIRST BIT
002712  104412                 2$:     CHKIT
002714  104001                         ERROR   1                       ;FAILED TO LOAD + READ BIT
002716  006337  001124         1$:     ASL     $GDDAT                  ;GET NEXT BIT
002722  023727  001124  010000         CMP     $GDDAT,#BIT12           ;FINISHED?
002730  001370                         BNE     2$              ;;NO,GO TO NEXT TEST

                                ;;*******************************************************************
                                ;*TEST 2         LOAD AND READ BACK ERROR I.E. BIT14
                                ;;*******************************************************************
002732  000004                 TST2:   SCOPE
002734  012737  040000  001124         MOV     #BIT14,$GDDAT
002742  104412                         CHKIT
002744  104001                         ERROR   1                       ;FAILED TO LOAD + READ ERROR I.E.
                                ;;*******************************************************************
                                ;*TEST 3         LOAD AND READ BACK INTERRUPT ENABLE BIT6
                                ;;*******************************************************************
002746  000004                 TST3:   SCOPE
002750  012777  001442  176346         MOV     #UNEXP,@VECTOR          ;SETUP FOR UNEXPECTED INTERUPT
002756  012737  000100  001124         MOV     #BIT6,$GDDAT            ;LOAD EXPECTED DATA
002764  104412                         CHKIT
002766  104001                         ERROR   1                       ;FAILED TO LOAD + READ INTERRUPT ENABLE

                                ;;*******************************************************************
                                ;*TEST 4         LOAD AND READ BACK CLOCK OVERFLOW START ENABLE BIT5
                                ;;*******************************************************************
002770  000004                 TST4:   SCOPE
002772  012737  000040  001124         MOV     #BIT5,$GDDAT            ;LOAD EXPECTED DATA
003000  104412                         CHKIT
003002  104001                         ERROR   1                       ;FAILED TO LOAD + READ CLOCK OVERFLOW START ENAB

                                ;;*******************************************************************
                                ;*TEST 5         LOAD AND READ BACK EXTERNAL START ENABLE BIT4
                                ;;*******************************************************************
003004  000004                 TST5:   SCOPE
003006  012737  000020  001124         MOV     #BIT4,$GDDAT    ;LOAD EXPECTED DATA
003014  104412                         CHKIT
003016  104001                         ERROR   1               ;FAILED TO LOAD + READ EXT. START ENABLE

                                ;;*******************************************************************
                                ;*TEST 6         LOAD AND READ BACK MAINT. TST BIT2
                                ;;*******************************************************************
003020  000004                 TST6:   SCOPE
003022  012737  000004  001124         MOV     #BIT2,$GDDAT
003030  104412                         CHKIT
003032  104001                         ERROR   1                       ;FAILED TO LOAD + READ BACK MAINT. TST
```

```
                                ;;*****************************************************************
                                ;*TEST 7         LOAD AND READ BACK ENABLE I.D. BIT3
                                ;;*****************************************************************
(2)  003034  000004             TST7:   SCOPE
305  003036  012737  000010  001124         MOV     #BIT3,$GDDAT
306  003044  104412                        CHKIT
307  003046  104001                        ERROR   1                       ;FAILED TO LOAD + READ ENABLE I.D. BIT
308                             ;;*****************************************************************
                                ;*TEST 10        TEST I.D. BIT (BIT 12) CLEARED
                                ;;*****************************************************************
(2)  003050  000004             TST10:  SCOPE
309  003052  012777  000001  176236         MOV     #1,@STREG               ;CLEAR I.D. ENABLE
310  003060  105777  176232         1$:    TSTB    @STREG                  ;WAIT FOR CONVERSION
311  003064  100375                        BPL     1$                      ;;CONVERSION IS NOT DONE YET
312  003066  017737  176230  001126         MOV     @ADBUFF,$BDDAT          ;READ BUFFER
313  003074  005037  001124                CLR     $GDDAT                  ;CLEAR EXPECTED
314  003100  032737  010000  001126         BIT     #BIT12,$BDDAT           ;IS I.D. BIT CLEARED?
315  003106  001401                        BEQ     TST11                   ;;YES - GOTO NEXT TEST
316  003110  104001                        ERROR   1
317
318                             ;;*****************************************************************
                                ;*TEST 11        TEST I.D. BIT (BIT 12) SET
                                ;;*****************************************************************
(2)  003112  000004             TST11:  SCOPE
319  003114  012777  000011  176174         MOV     #BIT3!BIT0,@STREG       ;SET I.D. ENABLE BIT
320  003122  105777  176170         1$:    TSTB    @STREG                  ;WAIT FOR CONVERSION
321  003126  100375                        BPL     1$                      ;;CONVERSION IS NOT DONE YET
322  003130  017737  176166  001126         MOV     @ADBUFF,$BDDAT          ;READ BUFFER
323  003136  012737  010000  001124         MOV     #BIT12,$GDDAT           ;LOAD EXPECTED
324  003144  032737  010000  001126         BIT     #BIT12,$BDDAT           ;IS I.D. BIT SET?
325  003152  001001                        BNE     TST12                   ;;YES - GOTO NEXT TEST
326  003154  104001                        ERROR   1
327
328                             ;;*****************************************************************
                                ;*TEST 12        LOAD AND READ BACK ERROR FLAG BIT15
                                ;;*****************************************************************
(2)  003156  000004             TST12:  SCOPE
329  003160  012737  100000  001124         MOV     #BIT15,$GDDAT           ;LOAD EXPECTED DATA
330  003166  104412                        CHKIT
331  003170  104001                        ERROR   1                       ;FAILED TO LOAD + READ ERROR FLAG
332                             ;;*****************************************************************
                                ;*TEST 13        TEST INIT CLEARS BITS 2-6,8-11,14
                                ;;*****************************************************************
(2)  003172  000004             TST13:  SCOPE
(1)  003174  012737  000300  001160         MOV     #300,$TIMES             ;;DO 300 ITERATIONS
333  003202  005037  001124                CLR     $GDDAT                  ;LOAD EXPECTED DATA
334  003206  012777  047574  176102  2$:    MOV     #47574,@STREG           ;SET STATUS REGISTER
335  003214  000005                        RESET                           ;INITIALIZE
336  003216  052777  000100  175720         BIS     #100,@$TKS              ;SET INTRPT. ENABLE
337  003224  017737  176066  001126         MOV     @STREG,$BDDAT           ;READ STATUS REGISTER
338  003232  001401                        BEQ     TST14                   ;;NEXT TEST
339  003234  104001                        ERROR   1                       ;RESET FAILED TO CLEAR AD ST. REG. BITS
340
```

```
                                ;;*****************************************************************
                                ;*TEST 14        TEST INIT CLEARS ERROR FLAG
                                ;;*****************************************************************
003236  000004                  TST14:  SCOPE
003240  012737  000300  001160          MOV     #300,$TIMES             ;DO 300 ITERATIONS
003246  012777  100000  176042          MOV     #BIT15,@STREG           ;SET BIT 15
003254  000005                          RESET                           ;ISSUE INIT
003256  052777  000100  175660          BIS     #100,@$TKS                      ;SET INTRPT. EN. FOR KEYBOARD
003264  104411                          CHECK
003266  104001                          ERROR   1
                                ;;*****************************************************************
                                ;*TEST 15        TEST  DONE FLAG  SETS AND BITO CLEARS ON END OF CONV.
                                ;;*****************************************************************
003270  000004                  TST15:  SCOPE
003272  012700  001000                  MOV     #BIT9,R0        ;STALL TIME COUNTER
003276  005277  176014                  INC     @STREG          ;START CONVERSION
003302  012737  000200  001124          MOV     #BIT7,$GDDAT    ;LOAD EXPECTED
003310  005300                  1$:     DEC     R0              ;STALL
003312  001376                          BNE     1$              ;TIME
003314  042777  100000  175774          BIC     #BIT15,@STREG   ;MASK OUT ERROR BIT
003322  104411                          CHECK
003324  104001                          ERROR   1               ;A/D DONE FLAG FAILED TO SET;BITO FAILED TO CLEAR
003326  017700  175770                  MOV     @ADBUFF,R0      ;CLEAR DONE FLAG FOR ITERATIONS
```

```
                                ;;*****************************************************************
                                ;*TEST 16        TEST INIT CLEARS DONE FLAG
                                ;;*****************************************************************
003332  000004                  TST16:  SCOPE
003334  012737  000300  001160          MOV     #300,$TIMES     ;;DO 300 ITERATIONS
003342  005037  001124                  CLR     $GDDAT          ;CLEAR EXPECTED
003346  005277  175744                  INC     @STREG          ;START CONVERSION
003352  105777  175740          2$:     TSTB    @STREG
003356  100375                          BPL     2$
003360  000005                          RESET
003362  104411                          CHECK
003364  104001                          ERROR   1               ;DONE FLAG FAILED TO CLEAR
003366  052777  000100  175550          BIS     #100,@$TKS              ;SET INTRPT. EN. BIT

                                ;;*****************************************************************
                                ;*TEST 17        TEST A/D DONE FLAG CLEARS WHEN READ CONVERTED VALUE
                                ;;*****************************************************************
003374  000004                  TST17:  SCOPE
003376  005277  175714                  INC     @STREG          ;SET A/D START CONVERSION BIT
003402  105777  175710          1$:     TSTB    @STREG          ;WAIT FOR FLAG
003406  100375                          BPL     1$
003410  017700  175706                  MOV     @ADBUFF,R0      ;READ CONVERTED VALUE
003414  104411                          CHECK
003416  104001                          ERROR   1               ;DONE FLAG FAILED TO CLEAR

                                ;;*****************************************************************
                                ;*TEST 20        TEST ALL '0'S RESULTS USING MAINT. ADTST. BIT
                                ;;*****************************************************************
003420  000004                  TST20:  SCOPE
003422  005037  001124                  CLR     $GDDAT          ;CLEAR EXPECTED VALUE
003426  005037  001372                  CLR     CHANL           ;SET CHANL = 0
003432  005037  001412                  CLR     SPREAD          ;SET SPREAD = 0
003436  012777  000005  175652          MOV     #5,@STREG       ;CONVERT EVEN CHANNEL WITH MAINT. BIT SET
003444  105777  175646          1$:     TSTB    @STREG          ;WAIT FOR DONE
003450  100375                          BPL     1$
003452  017737  175644  001126          MOV     @ADBUFF,$BDDAT  ;RESULTS TO BDDAT FOR CHECKING
003460  001401                          BEQ     TST21           ;;GOTO NEXT TEST
003462  104004                          ERROR   4               ;DID NOT GET ALL '0'S RSULT WITH MAINT. ADTST

                                ;;*****************************************************************
                                ;*TEST 21        TEST ALL '1'S RESULT USING MAINT. ADTST. BIT
                                ;;*****************************************************************
003464  000004                  TST21:  SCOPE
003466  012737  007777  001124          MOV     #7777,$GDDAT    ;EXPECT ALL '1'S RESULT
003474  012737  000001  001372          MOV     #1,CHANL        ;SET CHANL = 1
003502  005037  001412                  CLR     SPREAD          ;SET SPREAD = 0
003506  012777  000405  175602          MOV     #405,@STREG     ;CONVERT ODD CHANNEL WITH MAINT. BIT SET
003514  105777  175576          1$:     TSTB    @STREG          ;WAIT FOR DONE
003520  100375                          BPL     1$
003522  017737  175574  001126          MOV     @ADBUFF,$BDDAT  ;RESULTS TO BDDAT FOR CHECKING
003530  023737  001124  001126          CMP     $GDDAT,$BDDAT   ;EQUAL?
003536  001401                          BEQ     TST22           ;;GOTO NEXT TEST
003540  104004                          ERROR   4               ;DID NOT GET ALL '1'S RESULT WITH MAINT. ADTST
```

```
                                ;;*****************************************************************
                                ;*TEST 22       GENERATE INTERRUPT WHEN DONE FLAG SETS AFTER CONVERSION
                                ;;*****************************************************************
003542  000004                  TST22:  SCOPE
                                        ;* "ENTERING TEST 22" TYPED OUT TO TELL YOU THE NEXT
                                        ;*TEST THAT IS GOING TO BE EXECUTED. IT IS ONLY TYPED ON PASS 0.
                                        ;*THERE IS DANGER THAT THE UNIBUS COULD GET "HUNG" WHILE
                                        ;*EXECUTING TEST "22".
003544  012700  000022                MOV     #22,R0          ;GET TEST NO.
003550  004737  011254                JSR     PC,DUMW         ;PRINT MESSAGE
003554  005046                        CLR     -(SP)           ;RESET PRIORITY
003556  012746  003564                MOV     #3$,-(SP)
003562  000002                        RTI
003564  012777  003640  175532  3$:   MOV     #1$,@VECTOR     ;INTERRUPT VECTOR ADDRESS
003572  012777  000200  175530        MOV     #200,@VECTR1    ;SET UP NEW PSW
003600  012777  000101  175510        MOV     #BIT6!BIT0,@STREG ;SET INTERRUPT ENABLE BIT + START CONVERSION
003606  105777  175504          2$:   TSTB    @STREG          ;WAIT FOR DONE
003612  100375                        BPL     2$              ;FLAG TO SET
003614  017737  175476  001126        MOV     @STREG,$BDDAT   ;READ STATUS REGISTER
003622  012737  000300  001124        MOV     #BIT7!BIT6,$GDDAT ;GOOD DATA
003630  104002                        ERROR   2               ;FAILED TO INTERRUPT ON DONE
003632  004737  011326                JSR     PC,DUMC         ;TYPE COMPLETED
003636  000414                        BR      TST23           ;;BRANCH TO NEXT TEST
003640  022626                  1$:   CMP     (SP)+,(SP)+     ;RESET STACK POINTER
003642  012777  001442  175454        MOV     #UNEXP,@VECTOR  ;SET UP FOR UNEXPECTED INTERRUPT
003650  005046                        CLR     -(SP)           ;CLEAR PSW
003652  012746  003660                MOV     #4$,-(SP)
003656  000002                        RTI
003660  004737  011326          4$:   JSR     PC,DUMC         ;TYPE COMPLETED
003664  005777  175432                TST     @ADBUFF         ;CLEAR DONE BIT
                                ;;*****************************************************************
                                ;*TEST 23       TEST INTERRUPT OCCURS WHEN ERROR AND I.E.E. IS SET
                                ;;*****************************************************************
003670  000004                  TST23:  SCOPE
                                        ;* "ENTERING TEST 23" TYPED OUT TO TELL YOU THE NEXT
                                        ;*TEST THAT IS GOING TO BE EXECUTED. IT IS ONLY TYPED ON PASS 0.
                                        ;*THERE IS DANGER THAT THE UNIBUS COULD GET "HUNG" WHILE
                                        ;*EXECUTING TEST "23".
003672  012700  000023                MOV     #23,R0          ;GET TEST NO.
003676  004737  011254                JSR     PC,DUMW         ;PRINT MESSAGE
003702  012777  003742  175422        MOV     #1$,@VECTR2     ;SETUP VECTOR ADDRESS
003710  012777  140000  175400        MOV     #BIT15!BIT14,@STREG     ;CAUSE AN INTERRUPT
003716  017737  175374  001126        MOV     @STREG,$BDDAT   ;BAD DATA
003724  012737  140000  001124        MOV     #BIT15!BIT14,$GDDAT     ;GOOD DATA
003732  104002                        ERROR   2
003734  004737  011326                JSR     PC,DUMC         ;TYPE COMPLETED
003740  000627                        BR      TST20
003742  022626                  1$:   CMP     (SP)+,(SP)+     ;POP STACK
003744  004737  011326                JSR     PC,DUMC
003750  005077  175342                CLR     @STREG
```

```
                                        ;;*********************************************************************
                                        ;*TEST 24       TEST ERROR FLAG SETS IF  2ND CONVERSION ENDS BEFORE READING BUFFER
                                        ;;*********************************************************************
003754  000004                  TST24:  SCOPE
003756  012777  000001  175332          MOV     #BIT0,@STREG    ;START CONVERSION
003764  105777  175326          1$:     TSTB    @STREG          ;WAIT FOR
003770  100375                          BPL     1$
003772  012737  100200  001124  2$:     MOV     #BIT15!BIT7,$GDDAT ;LOAD EXPECTED VALUE
004000  012777  000001  175310          MOV     #BIT0,@STREG    ;START 2ND CONVERSION
004006  012700  001000                  MOV     #BIT9,R0        ;WAIT FOR 2ND
004012  005300                  3$:     DEC     R0              ;CONVERSION TO END
004014  001376                          BNE     3$
004016  104411                  4$:     CHECK
004020  104001                          ERROR   1               ;ERROR FLAG NOT SET WHEN 2ND
                                                                ; CONVERT ENDS BEFORE READ BUFFER FROM FIRST
004022  017700  175274                  MOV     @ADBUFF,R0      ;CLEAR DONE FLAG
                                        ;;*********************************************************************
                                        ;*TEST 25       TEST ERROR FLAG SETS IF START 2ND CONV. BEFORE DONE FLAG SETS
                                        ;;*********************************************************************
004026  000004                  TST25:  SCOPE
004030  012737  100000  001124          MOV     #BIT15,$GDDAT   ;LOAD EXPECTED DATA
004036  012777  000001  175252          MOV     #BIT0,@STREG    ;START CONVERSION
004044  112777  000001  175244          MOVB    #BIT0,@STREG            ;START NEXT CONVERSION
004052  112777  000001  175236          MOVB    #BIT0,@STREG            ;ONCE AGAIN IN CASE REFRESH INTERVENED
004060  017737  175232  001126          MOV     @STREG,$BDDAT           ;READ STATUS REGISTER
004066  042737  077777  001126          BIC     #77777,$BDDAT           ;MASK OUT BIT 15
004074  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
004102  001401                          BEQ     1$              ;;BRANCH OVER ERROR
004104  104001                          ERROR   1               ;ERROR FLAG NOT SET WHEN 2ND
                                                                ;CONVERT BEGINS BEFORE FIRST DONE
004106  105777  175204          1$:     TSTB    @STREG                  ;WAIT FOR DONE
004112  100375                          BPL     1$
004114  017700  175202                  MOV     @ADBUFF,R0              ;READ CONVERTED VALUE
004120  005077  175172                  CLR     @STREG                  ;CLEAR STATUS REGISTER
004124  000004                          SCOPE
004126  000207                          RTS     PC              ;RETURN TO TEST SECTION


                                        ;;SUBROUTINE FOR LOGIC TESTS;;
004130  013777  001124  175160  TESTIT: MOV     $GDDAT,@STREG           ;LOAD EXPECTED VALUE
004136  017737  175154  001126  TEST:   MOV     @STREG,$BDDAT           ;READ ST. REG.
004144  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
004152  001002                          BNE     RETERR          ;;ERROR RETURN
004154  062716  000002                  ADD     #2,(SP)                 ;BUMP RETURN ADDRESS TO GET AROUND ERROR
004160  000002                  RETERR: RTI
```

```
                                        .SBTTL      WRAPAROUND TEST SECTION
004162                                  WRAP:
                                        ;;**********************************************************************
                                        ;*TEST 26        TEST CH0 GROUND
                                        ;;**********************************************************************
004162  012737  000026  001102  TST26:  MOV     #$TN,$TSTNM
004170  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004176  012737  004162  001110          MOV     #TST26,$LPERR
004204  012737  004162  001106          MOV     #TST26,$LPADR
004212  004537  011074                  JSR     R5,CONVRT               ;CONVERT 8 TIMES
004216  000000                          0
004220  004537  011206                  JSR     R5,COMPAR               ;COMPARE RESULTS
004224  004000                          4000                            ;NOMINAL
004226  011654                          V12                             ;TOLERANCE
004230  104004                          ERROR   4                       ;ERROR ON A/D CHANNEL
                                        ;;**********************************************************************
                                        ;*TEST 27        TEST CH1 +4.5 VOLT
                                        ;;**********************************************************************
004232  000004  TST27:  SCOPE
004234  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004242  004537  011074                  JSR     R5,CONVRT               ;CONVERT 8 TIMES
004246  000001                          1                               ;CHANNEL 1
004250  004537  011206                  JSR     R5,COMPAR               ;COMPARE RESULTS
004254  007344                          7344                            ;NOMINAL
004256  011660                          V326                            ;TOLERANCE
004260  104004                          ERROR   4                       ;ERROR ON A/D CHANNEL

                                        ;;**********************************************************************
                                        ;*TEST 30        TEST CH2 -4.5 VOLT
                                        ;;**********************************************************************
004262  000004  TST30:  SCOPE
004264  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004272  004537  011074                  JSR     R5,CONVRT               ;CONVERT 8 TIMES
004276  000002                          2                               ;CHANNEL 2
004300  004537  011206                  JSR     R5,COMPAR               ;COMPARE RESULTS
004304  000434                          434                             ;NOMINAL
004306  011660                          V326                            ;TOLERANCE
004310  104004                          ERROR   4                       ;ERROR ON A/D CHANNEL
                                        ;;**********************************************************************
                                        ;*TEST 31        TEST GROUND ON CHANNELS 4 - 17
                                        ;;**********************************************************************
004312  000004  TST31:  SCOPE
004314  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004322  012737  000004  004334          MOV     #4,2$           ;SET UP FIRST CHANNEL
004330  004537  011074          1$:     JSR     R5,CONVRT       ;CONVERT CHANNEL
004334  000004          2$:     4
004336  004537  011206                  JSR     R5,COMPAR       ;TEST RESULTS
004342  004000                          4000
004344  011654                          V12
004346  104004                          ERROR   4
004350  005237  004334                  INC     2$              ;GET NEXT CHANNEL
004354  022737  000017  004334          CMP     #17,2$          ;DONE?
004362  001362                          BNE     1$              ;;NO
```

```
                                ;;*****************************************************************
                                ;*TEST 32        TEST VERNIER OFFSET DAC ON CH0
                                ;;*****************************************************************
004364  000004                  TST32:  SCOPE
004366  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
004374  005077  174722                  CLR     @ADBUFF                 ;SET VERNIER DAC = 0
004400  004537  011074                  JSR     R5,CONVRT               ;CONV. CH0, DIRECT VERNIER DAC
004404  000000                          0
004406  013704  001356                  MOV     TEMP,R4                 ;SAVE VALUE IN R4
004412  012777  000377  174702  1$:     MOV     #377,@ADBUFF            ;SET VERNIER DAC = 377
004420  004537  011074                  JSR     R5,CONVRT               ;CONVERT IT
004424  000000                          0
004426  160437  001356                  SUB     R4,TEMP                 ;TEMP=DIFF. BETWEEN VALUE & PREVIOUS
004432  004537  011206                  JSR     R5,COMPAR               ;COMPARE RESULTS
004436  000005                          5
004440  011650                          V2
004442  104004                          ERROR   4
                                ;;*****************************************************************
                                ;*TEST 33        OFFSET ON CH0
                                ;;*****************************************************************
004444  000004                  TST33:  SCOPE
004446  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
004454  013737  001342  001372          MOV     BASECH,CHANL            ;LOAD CHANNEL
004462  013737  001342  001370          MOV     BASECH,DUMMY            ;LOAD DUMMY
004470  004737  005214                  JSR     PC,OFFSET       ;FIND OFFSET
004474  104401  014014                  TYPE    ,MOFSET         ;TYPE "OFFSET="
004500  004737  005270                  JSR     PC,TOFF         ;TYPE OFFSET
004504  004537  011206                  JSR     R5,COMPAR       ;IS RESULT WITHIN LIMITS?
004510  000000                          0
004512  011656                          V50D
004514  000401                          BR      OFFERR          ;NO-ERROR
004516  000403                          BR      OFFOK           ;YES-Ok
004520  104401  012625  OFFERR:  TYPE    ,ERMSG
004524  000402                          BR      TST34           ;;GO TO NEXT TEST
004526  104401  012303  OFFOK:   TYPE    ,OKMSG
```

```
                                ;;*******************************************************************
                                ;*TEST 34       TEST RAMP RANGE, CH3
                                ;;*******************************************************************
004532  000004                  TST34:  SCOPE
004534  012737  000001  001160          MOV     #1,$TIMES               ;DO THIS ONCE
004542  012703  007777                  MOV     #7777,R3                ;INIT R3 VALUE
004546  005004                          CLR     R4                      ;AND R4
004550  012777  001400  174540          MOV     #1400,@STREG            ;SETUP FOR CH3
004556  012702  047040                  MOV     #20000.,R2              ;SETUP FOR 20,000 CONVERSIONS
004562  105277  174530          1$:     INCB    @STREG
004566  105777  174524          2$:     TSTB    @STREG
004572  100375                          BPL     2$
004574  027704  174522                  CMP     @ADBUFF,R4
004600  003402                          BLE     3$
004602  017704  174514                  MOV     @ADBUFF,R4              ;HIT A NEW HIGH
004606  027703  174510          3$:     CMP     @ADBUFF,R3
004612  002002                          BGE     4$
004614  017703  174502                  MOV     @ADBUFF,R3              ;HIT A NEW LOW
004620  005302                  4$:     DEC     R2
004622  001357                          BNE     1$
004624  010337  001356                  MOV     R3,TEMP
004630  004537  011206                  JSR     R5,COMPAR
004634  000000                          0
004636  011646                          V0
004640  104004                          ERROR   4                       ;RAMP DIDN'T REACH LOW END OF RANGE
004642  010437  001356                  MOV     R4,TEMP
004646  004537  011206                  JSR     R5,COMPAR
004652  007777                          7777
004654  011646                          V0
004656  104004                          ERROR   4                       ;RAMP DIDN'T REACH HIGH END OF RANGE
```

```
569                                     ;;*****************************************************************
(3)                                     ;*TEST 35       NOISE TEST, 1 EDGE
(3)                                     ;;*****************************************************************
(2)  004660  000004                     TST35:  SCOPE
(1)  004662  012737  000001  001160             MOV     #1,$TIMES       ;;DO 1 ITERATION
570  004670  104401  012042                     TYPE    ,NOIMSG
571  004674  005037  001372                     CLR     CHANL           ;LOAD CHANNEL 0
572  004700  013737  001372  001370  1$:       MOV     CHANL,DUMMY             ;LOAD DUMMY CHANNEL
573  004706  004737  006764                     JSR     PC,GETEDG               ;GET EDGE VALUE
574  004712  005037  001404                     CLR     RMS                     ;CLEAR RMS VLAUE
575  004716  005037  001406                     CLR     PEAK                    ;CLEAR PEAK VALUE
576  004722  004537  007144                     JSR     R5,SARSUB               ;DO SAR ROUTINE AT 16%
577  004726  000020                     16.
578  004730  063737  001414  001404             ADD     DAC,RMS         ;ADD RESULT TO RMS
579  004736  004537  007144                     JSR     R5,SARSUB               ;DO SAR ROUTINE AT 84%
580  004742  000124                     84.
581  004744  163737  001414  001404             SUB     DAC,RMS         ;SUBTRACT RESULT FROM RMS
582  004752  004537  007144                     JSR     R5,SARSUB               ;DO SAR ROUTINE AT 1%
583  004756  000001                     1
584  004760  063737  001414  001406             ADD     DAC,PEAK                ;ADD RESULT TO PEAK
585  004766  004537  007144                     JSR     R5,SARSUB               ;DO SAR ROUTINE AT 99%
586  004772  000143                     99.
587  004774  163737  001414  001406             SUB     DAC,PEAK                ;SUBTRACT RESULT FROM PEAK
588  005002  012737  000001  007142             MOV     #1,EDGFLG
589  005010  004737  010744                     JSR     PC,TYPRP                ;TYPE RMS AND PEAK VALUES
590  005014  005237  001372                     INC     CHANL                   ;GET NEXT CHANNEL
591  005020  022737  000003  001372             CMP     #3,CHANL                ;CHANNEL 3?
592  005026  001002                     BNE     2$              ;;NO
593  005030  005237  001372                     INC     CHANL           ;CHANNEL 3 IS SKIPED
594  005034  022737  000017  001372  2$:       CMP     #17,CHANL       ;DONE?
595  005042  001316                     BNE     1$              ;;NO
```

```
 597                                    ;;*****************************************************************
 (3)                                    ;*TEST 36       INTERCHANNEL SETTLING TEST, 1 EDGE
 (3)                                    ;;*****************************************************************
 (2)  005044  000004                    TST36:  SCOPE
 (1)  005046  012737  000001  001160            MOV     #1,$TIMES       ;;DO 1 ITERATION
 598  005054  104401  012061                    TYPE    ,SETMSG         ;TYPE "SETTLING TEST"
 599  005060  012737  000001  001360            MOV     #1,CH1          ;DO TEST BETWEEN CHANNEL 1 AND 2
 600  005066  012737  000002  001362            MOV     #2,CH2
 601  005074  013737  001362  001372  1$:       MOV     CH2,CHANL
 602  005102  004737  006764                    JSR     PC,GETEDG       ;GET EDGE VALUES
 603  005106  005002                            CLR     R2
 604  005110  004737  006722                    JSR     PC,SET1A        ;SCALING = .02 LSB
 605  005114  004737  006722                    JSR     PC,SET1A        ;MAKE IT .01 LSB
 606  005120  100001                            BPL     2$
 607  005122  005402                            NEG     R2              ;MAKE IT POSITIVE
 608  005124  010204                    2$:     MOV     R2,R4
 609  005126  012737  000001  007142            MOV     #1,EDGFLG
 610  005134  004737  006572                    JSR     PC,TYPSET       ;TYPE SETTLING INFORMATION
 611  005140  022737  000002  001360            CMP     #2,CH1          ;DONE?
 612  005146  001410                            BEQ     TST37           ;;YES
 613  005150  013702  001360                    MOV     CH1,R2          ;SETTLE THE OTHER WAY
 614  005154  013737  001362  001360            MOV     CH2,CH1
 615  005162  010237  001362                    MOV     R2,CH2
 616  005166  000742                            BR      1$              ;;
 617  005170                            3$:
 618                                    ;;*****************************************************************
 (3)                                    ;*TEST 37       DIFFERENTIAL LINEARITY AND RELATIVE ACCURACY TEST
 (3)                                    ;;*****************************************************************
 (2)  005170  000004                    TST37:  SCOPE
 (1)  005172  012737  000001  001160            MOV     #1,$TIMES       ;;DO 1 ITERATION
 619  005200  005737  001202                    TST     $PASS           ;FIRST TIME-SKIP DIFLIN
 620  005204  001402                            BEQ     LEND
 621  005206  004737  007344                    JSR     PC,DIFLIN
 622  005212  000207                    LEND:   RTS     PC              ;RETURN TO TEST SECTION
 623
 624  005214  012737  004001  001420  OFFSET: MOV     #4001,EDGE      ;4000,4001 EDGE
 625  005222  004537  007144                    JSR     R5,SARSUB
 626  005226  000062                            50.
 627  005230  013737  001414  001356            MOV     DAC,TEMP
 628  005236  012737  004000  001420            MOV     #4000,EDGE      ;3777,4000 EDGE
 629  005244  004537  007144                    JSR     R5,SARSUB
 630  005250  000062                            50.
 631  005252  063737  001414  001356            ADD     DAC,TEMP
 632  005260  162737  000400  001356            SUB     #400,TEMP
 633  005266  000207                            RTS     PC
```

```
                                TOFF:   MOV     TEMP,R2
                                        BMI     1$              ;;IS THE NUMBER POSITIVE?
                                        TYPE    ,POSITV
                                1$:     TYPDC
                                        TYPE    ,MLSB           ;TYPE ASCIZ STRING
                                        RTS     PC
                                TCHK:   DEC     R3              ;DECREMENT COUNT
                                        BNE     1$              ;;
                                        MOV     #5,R3           ;RESET COUNT
                                        TYPE    ,$CRLF          ;TYPE A CARRIAGE RETURN AND LINE FEED
                                        BR      2$              ;;
                                1$:     TYPE    ,SPACE          ;TYPE FOUR (4) SPACES
                                2$:     CLR     DELAY           ;CLEAR DELAY
                                        CLR     @$TKS           ;CLEAR INTERRUPT ENABLE
                                3$:     TSTB    @$TKS           ;IS KEYBOARD FLAG SET?
                                        BMI     4$              ;;YES
                                        INC     DELAY           ;IS DELAY ZERO?
                                        BNE     3$              ;;NO
                                        BR      6$              ;;
                                4$:     TST     @$TKB           ;CLEAR FLAG
                                        MOV     #100,@$TKS      ;SET INTERRUPT ENABLE
                                        JSR     R5,COMPAR       ;TEST LAST CONVERSION
                                        0
                                        V4                      ;TOLERANCE .04 LSB
                                        BR      5$              ;;
                                        ADD     #2,(SP)         ;BUMP RETURN ADDRESS
                                5$:     ADD     #2,(SP)         ;BUMP RETURN ADDRESS 2 WORDS
                                6$:     RTS     PC
                                BEGINC: TYPE    ,CCHAN          ;ASK FOR CHANNEL
                                        RDOCT                   ;READ CHANNEL NUMBER
                                        MOV     (SP)+,CHANL     ;STORE CHANNEL NUMBER
                                        MOV     CHANL,DUMMY     ;LOAD DUMMY
                                1$:     TYPE    ,SEL            ;SELECT OFFSET OR GAIN ADJUST
                                        RDLIN                   ;GET TEST
                                        MOV     (SP)+,R0        ;MOVE POINTER TO R0
                                        CMPB    (R0),#'O        ;IS IT "O"?
                                        BEQ     AJOFF           ;;YES, GO TO ADJUST OFFSET
                                        CMPB    (R0),#'G        ;IS IT "G"?
                                        BEQ     AJGAIN          ;;YES, GO TO ADJUST GAIN
                                        TYPE    ,$QUES          ;TYPE "?"
                                        BR      1$              ;;
```

```
                                AJOFF:  TYPE    ,IGND           ;GROUND CHANNEL
                                        RDLIN                   ;WAIT FOR CR
                                        TST     (SP)+           ;POP 1 WORD OFF STACK
                                1$:     TYPE    ,XADJ           ;ADJUST MESSAGE
                                        TYPE    ,CRWR           ;TYPE "TYPE CR WHEN READY"
                                        MOV     #5,R3           ;SET UP COUNT
                                2$:     JSR     PC,OFFSET       ;TEST AND TYPE OFFSET ERROR
                                        JSR     PC,TOFF         ;TYPE OFFSET
                                        JSR     PC,TCHK         ;CHECK FOR A CHARACTER AND DELAY
                                        BR      2$              ;;
                                        BR      1$              ;;NOT WITHIN TOLLERANCE, TRY AGAIN
                                        RESET
                                        JMP     BEG2
                                AJGAIN: TYPE    ,IVOLT          ;INPUT +5.115 VOLTS ON CHANNEL
                                        TYPE    ,CRWR
                                        RDLIN                   ;WAIT FOR CR
                                        TST     (SP)+           ;POP 1 WORD OFF STACK
                                1$:     TYPE    ,YADJ           ;ADJUST MESSAGE
                                        TYPE    ,MOLSB          ;TYPE " FOR 0.00 LSB ERROR"
                                        TYPE    ,CRWR
                                        MOV     #5,R3           ;SET UP COUNT
001420                          2$:     MOV     #7777,EDGE      ;LOOK FOR 7776,7777 EDGE
                                        JSR     R5,SARSUB
                                        50.
001356                                  MOV     DAC,TEMP        ;SAVE DAC
001420                                  MOV     #7776,EDGE      ;LOOK FOR 7775,7776 EDGE
                                        JSR     R5,SARSUB
                                        50.
001356                                  ADD     DAC,TEMP        ;ADD RESULTS
001356                                  SUB     #400,TEMP       ;OFFSET RESULT
                                        JSR     PC,TOFF         ;TYPE GAIN
                                        JSR     PC,TCHK         ;CHECK FOR CHARACTER AND DELAY
                                        BR      2$              ;;
                                        BR      1$              ;;NOT WITHIN TOLLERANCE, TRY AGAIN
                                        RESET
                                        JMP     BEG2
```

```
                                        .SBTTL      PRINT VALUES ROUTINE
005674  012737  005674  001374  BEGINP: MOV     #BEGINP,TADDR           ;TEST ADDRESS IN TADDR
005702  005077  173410                  CLR     @STREG                  ;CLEAR STATUS REGISTER
005706  104401  013723                  TYPE    ,HEAD5                  ;TYPE OUT HEADING
005712  005046                          CLR     -(SP)                   ;CLEAR PSW
005714  012746  005722                  MOV     #1$,-(SP)
005720  000002                          RTI
005722  017700  173212          1$:     MOV     @SWR,R0                 ;READ CHANNEL FROM SWITCH REG.
005726  042700  177700                  BIC     #177700,R0              ;ISOLATE MUX BITS
005732  032777  020000  173200          BIT     #BIT13,@SWR             ;IS BIT 13 SET?
005740  001005                          BNE     2$              ;;YES,SKIP TYPEOUT
005742  104401  012167                  TYPE    ,CH
005746  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
(1)                                                             ;;TYPE CHANNEL
005750  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
005752     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
005753     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
005754  012777  001620  173342  2$:     MOV     #RETURN,@VECTOR         ;ADDRESS AFTER INTRPT.
005762  000300                          SWAB    R0                      ;SWITCH BYTES
005764  052700  000100                  BIS     #BIT6,R0
005770  010077  173322                  MOV     R0,@STREG               ;LOAD THE CHANNEL
005774  012702  000010                  MOV     #10,R2                  ;TYPEOUT COUNTER
006000  005277  173312          3$:     INC     @STREG                  ;START CONVERSION
006004  000001                          WAIT                            ;WAIT FOR INTRPT.
006006  017700  173310                  MOV     @ADBUFF,R0              ;READ CONVERTED VALUE
006012  032777  020000  173120          BIT     #BIT13,@SWR             ;IS BIT 13 SET?
006020  001403                          BEQ     4$                      ;NOT SET, TYPE OUT LIST
006022  010077  173114                  MOV     R0,@DISPLAY                     ;PUT VALUE IN DISPLAY FOR DISPLAY CONTRO
006026  000735                          BR      1$                      ;REPEAT CONVERSION
006030  104401  012172          4$:     TYPE    ,SPACE
006034  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
(1)                                                             ;;PRINT OCTAL CONVERTED VALUE
006036  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
006040     004                          .BYTE   4               ;;TYPE 4 DIGIT(S)
006041     001                          .BYTE   1               ;;TYPE LEADING ZEROS
006042  012701  010000                  MOV     #10000,R1
006046  005301          5$:     DEC     R1
006050  001376                  BNE     5$
006052  005302                  DEC     R2                      ;DECREMENT THE COUNTER
006054  001351                  BNE     3$                      ;NO CARRIAGE RETURN
006056  104401  001171                  TYPE    ,$CRLF                  ;CARRIAGE RETURN
006062  000717                          BR      1$                      ;REPEAT CONVERSION
```

```
                                        .SBTTL      LOGIC TEST SECTION
006064  012737  006064  001374  BEGL:   MOV     #BEGL,TADDR         ;TEST ADDRESS
006072  004737  002464          JSR     PC,TESTAD           ;NO OF ADDITIONAL AD'S
006076  004737  002670  1$:     JSR     PC,BEGINL           ;LOGIC TESTS
006102  004737  006242          JSR     PC,BUMPAD           ;MORE TO TEST?
006106  000773                  BR      1$                  ;TEST NEXT A/D
006110  012737  006076  011704  MOV     #1$,AGTST           ;ADDRESS FOR EOP
006116  000137  011706          JMP     $EOP                ;TYPE END OF PASS

                                        .SBTTL      AUTO TEST
006122  012737  006122  001374  BEGINA: MOV     #BEGINA,TADDR       ;TEST ADDRESS
006130  004737  002464          JSR     PC,TESTAD           ;NO. OF AD'S TO BE TESTED
006134  004737  002670  1$:     JSR     PC,BEGINL           ;LOGIC TESTS
006140  104401  013115          TYPE    ,MEND               ;TYPE END OF LOGIC TEST
006144  013746  001316          MOV     STREG,-(SP)         ;SAVE STREG FOR TYPEOUT
006150  104403                  TYPOS                       ;TYPE OCTAL NUMBER
006152     006                  .BYTE   6                   ;TYPE 6 DIGITS
006153     001                  .BYTE   1                   ;TYPE LEADING ZEROS
006154  104401  001171          TYPE    ,$CRLF              ;TYPE A CR,LF
006160  004737  004162          JSR     PC,WRAP
006164  004737  006242          JSR     PC,BUMPAD           ;TEST NEXT A/D
006170  000761                  BR      1$                  ;TEST NEXT AD
006172  012737  006134  011704  MOV     #1$,AGTST           ;ADDRESS FOR EOP
006200  000137  011706          JMP     $EOP                ;TYPE END OF PASS

                                        .SBTTL      WRAPAROUND TEST
006204  012737  006204  001374  BEGINW: MOV     #BEGINW,TADDR       ;TEST ADDRESS
006212  004737  002464          JSR     PC,TESTAD           ;NO. OF AD'S TO BE TESTED
006216  004737  004162  1$:     JSR     PC,WRAP             ;WRAPAROUND TESTS
006222  004737  006242          JSR     PC,BUMPAD           ;MORE A/D'S TO BE TESTED?
006226  000773                  BR      1$                  ;YES-GO TEST NEXT ADV11
006230  012737  006216  011704  MOV     #1$,AGTST
006236  000137  011706          JMP     $EOP                ;INCREMENTS $PASS
```

```
                                        .SBTTL      DETERMINE IF MORE ADV11'S TO BE TESTED
006242  005737  001364           BUMPAD: TST     NBEXT                   ;ADDITIONAL AD'S?
006246  001434                           BEQ     FIXADR                  ;NO-INITIALIZE ADDRESSES
006250  006337  001440                   ASL     TSTBIT          ;MOVE BIT TO NEXT MODULE
006254  063737  001336  001316           ADD     VADR,STREG              ;SET UP NEW ST. REG.
006262  063737  001336  001320           ADD     VADR,ADST1              ;SET UP NEW ADST1
006270  063737  001336  001322           ADD     VADR,ADBUFF             ;SET UP NEW BUFFER ADDRESS
006276  063737  001340  001324           ADD     VVCT,VECTOR             ;SET UP NEW VECTOR
006304  063737  001340  001330           ADD     VVCT,VECTR1
006312  063737  001340  001332           ADD     VVCT,VECTR2
006320  063737  001340  001334           ADD     VVCT,VECTR3
006326  005077  172776                   CLR     @VECTR1
006332  005337  001364                   DEC     NBEXT                   ;ONE LESS ADV11
006336  000473                           BR      BYPASS
006340  062716  000002           FIXADR: ADD     #2,(SP)
006344  012737  000006  000004   FIXONE: MOV     #6,@#ERRVEC             ;SET UP ERRVEC
006352  012737  007336  000010           MOV     #DELAY4,@#RESVEC        ;SETUP RESERVED INST. VECTOR
006360  012737  000001  001440           MOV     #1,TSTBIT       ;INITIALIZE MODULE ERROR TEST BIT
006366  013737  001250  001316           MOV     $BASE,STREG             ;RELOAD INITIAL ADDRESSES
006374  013737  001250  001320           MOV     $BASE,ADST1
006402  013737  001250  001322           MOV     $BASE,ADBUFF
006410  005237  001320                   INC     ADST1
006414  062737  000002  001322           ADD     #2,ADBUFF
006422  013737  001244  001324           MOV     $VECT1,VECTOR
006430  042737  170000  001324           BIC     #170000,VECTOR
006436  113737  001245  001326           MOVB    $VECT1+1,BASEBR
006444  105037  001327                   CLRB    BASEBR+1                ;CLEAR HIGH BYTE
006450  013737  001324  001330           MOV     VECTOR,VECTR1
006456  062737  000002  001330           ADD     #2,VECTR1
006464  013737  001324  001332           MOV     VECTOR,VECTR2
006472  062737  000004  001332           ADD     #4,VECTR2
006500  013737  001324  001334           MOV     VECTOR,VECTR3
006506  062737  000006  001334           ADD     #6,VECTR3
006514  005077  172610                   CLR     @VECTR1
006520  013737  001366  001364           MOV     NMBEXT,NBEXT            ;RESET COUNTER
                                ;;LOAD .+2 AND HALT TRAP CATCH;;
006526  012700  000216           BYPASS: MOV     #216,R0                 ;FILL .+2
006532  012701  000214                   MOV     #214,R1                 ;LOAD HALT
006536  020137  001344           1$:     CMP     R1,KBVECT
006542  001410                           BEQ     2$
006544  010021                           MOV     R0,(R1)+
006546  005021                           CLR     (R1)+
006550  010100                           MOV     R1,R0
006552  005720                           TST     (R0)+
006554  020027  001002                   CMP     R0,#1002
006560  001366                           BNE     1$
006562  000207                           RTS     PC                      ;TEST NEXT A/D
006564  022021                   2$:     CMP     (R0)+,(R1)+
006566  022021                           CMP     (R0)+,(R1)+
006570  000762                           BR      1$
```

```
                                TYPSET: TYPDC
                                        TYPE    ,LSB
006600  013746  001362                  MOV     CH2,-(SP)       ;;SAVE CH2 FOR TYPEOUT
(1)                                                             ;;TYPE CH
006604  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
006606     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
006607     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
006610  104401  014035                  TYPE    ,MAT            ;TYPE ASCIZ STRING
006614  004737  007100                  JSR     PC,TYPEDG
006620  104401  012212                  TYPE    ,SETCH
006624  013746  001360                  MOV     CH1,-(SP)       ;;SAVE CH1 FOR TYPEOUT
(1)                                                             ;;TYPE CH
006630  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
006632     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
006633     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
006634  104401  012234                  TYPE    ,ATMSG
006640  013737  001360  006666          MOV     CH1,1$
006646  163737  001342  006666          SUB     BASECH,1$
006654  012777  000200  172440          MOV     #200,@ADBUFF
006662  004537  011074                  JSR     R5,CONVRT
006666  000000                  1$:     0
006670  013746  001356                  MOV     TEMP,-(SP)      ;;SAVE TEMP FOR TYPEOUT
(1)                                                             ;;TYPE VALUE
006674  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
006676     004                          .BYTE   4               ;;TYPE 4 DIGIT(S)
006677     001                          .BYTE   1               ;;TYPE LEADING ZEROS
006700  020437  011666                  CMP     R4,VSET
006704  003003                          BGT     ERR
006706  104401  012303                  TYPE    ,OKMSG
006712  000207                          RTS     PC
006714  104401  012625          ERR:    TYPE    ,ERMSG
006720  000207                          RTS     PC

                                ;;SUBROUTINE FOR SETTLING TESTS;;
006722  013737  001362  001370  SET1A:  MOV     CH2,DUMMY               ;LOAD DUMMY
006730  004537  007144                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 50%
006734  000062                          50.
006736  063702  001414                  ADD     DAC,R2          ;ADD RESULT TO R2
006742  013737  001360  001370          MOV     CH1,DUMMY               ;CHANGE DUMMY VALUE
006750  004537  007144                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 50%
006754  000062                          50.
006756  163702  001414                  SUB     DAC,R2          ;SUBTRACT RESULT FROM R2
006762  000207                          RTS     PC              ;RETURN
```

```
                                        ;SUBROUTINE TO GET EDGE VALUE
                                        ;CALL=JSR   PC,GETEDG
                                        ;CONVERSIONS ON A/D CHANNEL 'CHANL'
                                        ;RESULT IN EDGE, USES R0
006764  012777  000200  172330  GETEDG: MOV     #200,@ADBUFF    ;LOAD VERNIER DAC
006772  113700  001372                  MOVB    CHANL,R0                ;GET CHANNEL
006776  000300                          SWAB    R0              ;SET UP A.D STATUS REG.
007000  052700  000100                  BIS     #100,R0         ;ENABLE INTRPT.
007004  010077  172306                  MOV     R0,@STREG
007010  012700  000100                  MOV     #100,R0         ;DAC SETTLING DELAY
007014  005300                  1$:     DEC     R0
007016  001376                          BNE     1$
007020  005037  001420                  CLR     EDGE
007024  012700  000010                  MOV     #10,R0
007030  012777  001620  172266          MOV     #RETURN,@VECTOR         ;RETURN ADDRESS
007036  005277  172254          CONV:   INC     @STREG                  ;START CONVERSION
007042  000001                          WAIT                            ;WAIT FOR INTERRUPT
007044  067737  172252  001420          ADD     @ADBUFF,EDGE
007052  005300                          DEC     R0
007054  001370                          BNE     CONV
007056  006237  001420                  ASR     EDGE
007062  006237  001420                  ASR     EDGE
007066  006237  001420                  ASR     EDGE
007072  005537  001420                  ADC     EDGE
007076  000207                          RTS     PC

                                        ;;SUBROUTINE TO TYPE EDGE VALUES;;
007100  013703  001420          TYPEDG: MOV     EDGE,R3
007104  010346                          MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
(1)                                                             ;;TYPE OCTAL VALUE OF EDGE
(1)     007106  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)     007110     004                  .BYTE   4               ;;TYPE 4 DIGIT(S)
(1)     007111     001                  .BYTE   1               ;;TYPE LEADING ZEROS
007112  023727  007142  000001          CMP     EDGFLG,#1
007120  001407                          BEQ     RET
007122  062703  000007                  ADD     #7,R3
007126  104401  012103                  TYPE    ,MINUS          ;TYPE ASCIZ STRING
007132  010346                          MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
(1)                                                             ;;TYPE EDGE VALUE
(1)     007134  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)     007136     004                  .BYTE   4               ;;TYPE 4 DIGIT(S)
(1)     007137     001                  .BYTE   1               ;;TYPE LEADING ZEROS
007140  000207                  RET:    RTS     PC
007142  000000                  EDGFLG: 0
```

```
                                ;SUBROUTINE TO DO SUCCESSIVE APPROXIMATION ROUTINE
                                ;CALL=JSR   R5,SARSUB
                                  ;  XXX;XXX=PERCENT
                                ;RESULT RETURNED IN 'DAC',USES R0,R1,R4
007144  012537  001432        SARSUB: MOV     (R5)+,PERCNT            ;GET PERCENT
007150  006337  001432                ASL     PERCNT
007154  006337  001432                ASL     PERCNT
007160  006337  001432                ASL     PERCNT                  ;RESCALE PERCENT FOR 1600.
007164  006337  001432                ASL     PERCNT                  ;POINTS PER BURST
007170  012737  000200  001422  SAR1:    MOV     #200,BITPNT             ;INITIALIZE BIT POINTER AT MSB
007176  005037  001414                CLR     DAC                     ;INITIALIZE DAC VALUE
007202  005000                    TRY:    CLR     R0
007204  063737  001422  001414          ADD     BITPNT,DAC              ;TRY BIT
007212  013777  001414  172102          MOV     DAC,@ADBUFF
007220  012701  003100                MOV     #1600.,R1               ;SET UP FOR 1600. CONVERSIONS
007224  113777  001370  172066  NXTCVT: MOVB    DUMMY,@ADST1            ;PRESET MUX TO DUMMY CHANNEL
007232  012777  001620  172064          MOV     #RETURN,@VECTOR         ;RETURN ADDRESS
007240  052777  000101  172050          BIS     #101,@STREG             ;CONVERSION ON DUMMY CHANNEL
007246  000001                        WAIT                            ;WAIT FOR INTERRUPT
007250  017704  172046                MOV     @ADBUFF,R4              ;DUMMY READ
007254  013704  001372                MOV     CHANL,R4
007260  000304                        SWAB    R4
007262  052704  000101                BIS     #101,R4                 ;INTERRUPT ENABLE START
007266  010477  172024                MOV     R4,@STREG               ;JUMP TO CHANNEL + START CONVERT
007272  000001                        WAIT                            ;WAIT FOR INTERRUPT
007274  027737  172022  001420        CMP     @ADBUFF,EDGE
007302  002001                      BGE     2$
007304  005200                      INC     R0                      ;COUNT RESULTS .LT. EDGE
007306  005301                2$:     DEC     R1
007310  001345                      BNE     NXTCVT
007312  020037  001432              CMP     R0,PERCNT
007316  003003                      BGT     SHIFT
007320  163737  001422  001414      SUB     BITPNT,DAC              ;TAKE THE BIT OUT
007326  006237  001422        SHIFT:  ASR     BITPNT
007332  001323                      BNE     TRY
007334  000205                      RTS     R5

                                ;*ROUTINE FOR PROCESSERS THAT CAN'T DO A SOB INSTRUCTION

007336  005300                DELAY4: DEC     R0              ;DECREMENT R0, IS IT ZERO?
007340  001376                        BNE     DELAY4          ;NO
007342  000002                        RTI                     ;RETURN
```

```
                                ;;DIFFERENTIAL LINEARITY SUBROUTINE;;
007344  104401  013240         DIFLIN: TYPE    ,MSG20
007350  013702  001376                 MOV     RNA,R2          ;SET UP RANDOM NUMBER GENERATOR
007354  013704  001400                 MOV     RNB,R4
007360  013705  001402                 MOV     RNC,R5
007364  012700  020034                 MOV     #BUFFER,R0
007370  012701  010000                 MOV     #4096.,R1       ;4096 WORDS FOR HISTOGRAM
007374  005020                 CLEAR1: CLR     (R0)+           ;CLEAR BUFFER AREA
007376  005301                         DEC     R1
007400  001375                         BNE     CLEAR1
007402  012700  017214                 MOV     #DIST,R0        ;DISTRIBUTION BUFFER POINTER
007406  012701  000310                 MOV     #200.,R1        ;200. WORDS FOR DISTRIBUTION
007412  005003                         CLR     R3
007414  005037  001434                 CLR     OUT
007420  005037  001346                 CLR     WIDE
007424  005037  001350                 CLR     NARROW
007430  005037  001352                 CLR     FIRST
007434  005037  001354                 CLR     SKIPST
007440  005020                 CLEAR2: CLR     (R0)+           ;CLEAR DISTRIBUTION BUFFER AREA
007442  005301                         DEC     R1
007444  001375                         BNE     CLEAR2
007446  012700  000003         CHANNL: MOV     #3,R0           ;CHANNEL 3
007452  063700  001342                 ADD     BASECH,R0
007456  000300                         SWAB    R0                              ;LOAD MUX BITS
007460  052700  000100                 BIS     #100,R0
007464  010077  171626                 MOV     R0,@STREG
007470  012737  001440  001416         MOV     #800.,DELAY     ;NOMINAL STATE WIDTH - 1 LSB
007476  012777  001630  171620         MOV     #RET1,@VECTOR
007504  012701  007776         AGAIN:  MOV     #4094.,R1
007510  060402                 NEXT:   ADD     R4,R2
007512  060502                         ADD     R5,R2
007514  005502                         ADC     R2
007516  060204                         ADD     R2,R4
007520  060504                         ADD     R5,R4
007522  005504                         ADC     R4
007524  060205                         ADD     R2,R5
007526  060405                         ADD     R4,R5
007530  005505                         ADC     R5
007532  010500                         MOV     R5,R0           ;COPY INTO DELAY
007534  042700  177770                 BIC     #177770,R0      ;MASK IT TO 4 BITS ONLY
007540  001401                         BEQ     CONVR
007542  077001                 DELAY3: SOB     R0,DELAY3       ;STALL TIME
007544  005277  171546         CONVR:  INC     @STREG          ;START CONVERSION
007550  000001                         WAIT
007552  000240                         NOP
007554  017700  171542                 MOV     @ADBUFF,R0      ;GET CONVERTED VALUE
007560  001416                         BEQ     DELAY1          ;IGNORE IF =0
007562  020027  007777                 CMP     R0,#7777        ;IGNORE IF =7777
007566  001416                         BEQ     DELAY2
007570  006300                         ASL     R0
007572  005260  020034                 INC     BUFFER(R0)      ;MAKE HISTOGRAM
007576  100016                         BPL     OKAY
007600  012760  077777  020034         MOV     #077777,BUFFER(R0)      ;PREVENT OVERFLOW
007606  000412                         BR      OKAY
```

```
                                NOTOK:  CLR     TEMP
                                        BR      OKAY
                                DELAY1: CMP     R0,#7777        ;EQUALIZE LOOP TIME
                                        BEQ     DELAY2          ;WITH DUMMY INSTR.
                                DELAY2: INC     R1
                                        INC     TEMP(R3)
                                        BMI     NOTOK
                                OKAY:   DEC     R1
                                        BNE     NEXT
                                AROUND: DEC     DELAY
                                        BNE     AGAIN
                                        MOV     #4094.,R0
                                        MOV     #BUFFER+2,R1
                                READ:   MOV     (R1)+,R2        ;GET STATE WIDTH
                                        ASR     R2              ;1 LSB = 800.
                                        ASR     R2
                                        ASR     R2
                                        ADC     R2              ;1 LSB = 100.
                                        CMP     R2,#200.        ;OUT OF RANGE?
                                        BLT     INRNGE
                                        INC     OUT             ;YES - INCREMENT COUNTER
                                        BR      TYPBAD
                                INRNGE: ASL     R2
                                        INC     DIST(R2)        ;MAKE STATE WIDTH DISTRIBUTION
                                        ASR     R2
                                        CMP     R2,#50.         ;IS IT 1/2 LSB?
                                        BGE     NOTNAR
                                        INC     NARROW
                                        TST     R2              ;IS IT A SKIPPED STATE?
                                        BNE     31$
                                        INC     SKIPST
                                31$:    BR      TYPBAD
                                NOTNAR: CMP     R2,#150.        ;IS IT 1.5 LSB?
                                        BLE     LAST
                                        INC     WIDE
                                TYPBAD: TST     FIRST
                                        BNE     60$
                                        INC     FIRST
                                        TYPE    ,STATE
                                60$:    MOV     R1,R3
                                        SUB     #BUFFER+2,R3
                                        ASR     R3
                                        MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
 (1)                                                            ;;TYPE STATE
 (1)                                    TYPOS                   ;;GO TYPE--OCTAL ASCII
 (1)                                    .BYTE   4               ;;TYPE 4 DIGIT(S)
 (1)                                    .BYTE   1               ;;TYPE LEADING ZEROS
                                        TYPE    ,DASH
                                        TYPDC
                                        TYPE    ,LSBMSG
```

```
1048  010020  005300                  LAST:   DEC     R0
1049  010022  001315                          BNE     READ
1050  010024  112737  000177  014620          MOVB    #177,DECPNT
1051  010032  013702  001354                  MOV     SKIPST,R2               ;GET NO. OF SKIPPED STATES
1052  010036  104413                          TYPDC                           ;TYPE IT
1053  010040  104401  012642                  TYPE    ,SKPMSG         ;TYPE MESSAGE
1054  010044  005737  001354                  TST     SKIPST
1055  010050  001403                          BEQ     1$
1056  010052  104401  012625                  TYPE    ,ERMSG          ;TYPE ''ERROR''
1057  010056  000402                          BR      NAR
1058  010060  104401  012303          1$:     TYPE    ,OKMSG          ;TYPE #OK#
1059  010064  013702  001350          NAR:    MOV     NARROW,R2               ;GET NO. OF NARROW STATES
1060  010070  104413                          TYPDC                           ;TYPE IT
1061  010072  104401  012664                  TYPE    ,NARMSG         ;TYPE MESSAGE
1062  010076  013702  001346                  MOV     WIDE,R2
1063  010102  063702  001434                  ADD     OUT,R2
1064  010106  104413                          TYPDC                           ;TYPE NO. OF WIDE STATES
1065  010110  104401  012723                  TYPE    ,WIDMSG         ;TYPE MESSAGE
1066  010114  013702  001434                  MOV     OUT,R2
1067  010120  104413                          TYPDC                           ;TYPE NO. OF STATES OUTSIDE 2 LSB
1068  010122  104401  012762                  TYPE    ,OUTMSG         ;TYPE MESSAGE
1069  010126  005737  001434                  TST     OUT
1070  010132  001403                          BEQ     11$
1071  010134  104401  012625                  TYPE    ,ERMSG          ;TYPE ''ERROR''
1072  010140  000402                          BR      HALF
1073  010142  104401  012303          11$:    TYPE    ,OKMSG          ;TYPE ''OK''
1074  010146  013702  001350          HALF:   MOV     NARROW,R2
1075  010152  063702  001346                  ADD     WIDE,R2
1076  010156  063702  001434                  ADD     OUT,R2
1077  010162  010200                          MOV     R2,R0
1078  010164  104413                          TYPDC                           ;TYPE NO. OF STATES OUTSIDE LIMITS
1079  010166  112737  000056  014620          MOVB    #56,DECPNT
1080  010174  104401  013015                  TYPE    ,HAFMSG
1081  010200  020027  000051                  CMP     R0,#41.         ;COMPARE IT TO NOMINAL
1082  010204  003403                          BLE     21$
1083  010206  104401  012625                  TYPE    ,ERMSG          ;TYPE ''ERROR''
1084  010212  000402                          BR      SWDIST
1085  010214  104401  012303          21$:    TYPE    ,OKMSG          ;TYPE ''OK''
1086  010220  005737  001410          SWDIST: TST     FLAG            ;VT55?
1087  010224  001426                          BEQ     RELACC
1088  010226  004737  010704                  JSR     PC,DELCLR       ;WAIT AWHILE, THEN CLEAR VT55
1089  010232  104401  013272                  TYPE    ,MSG16
1090  010236  104401  014064                  TYPE    ,BUFF1          ;TYPE BUFF1-PRINT GRID
1091  010242  012700  017214                  MOV     #DIST,R0        ;POINTER TO STATE WIDTH DISTRIBUTION
1092  010246  012701  000310                  MOV     #200.,R1        ;GO 200. TIMES UP TO 2 LSB
1093  010252  012002                  NXTY1:  MOV     (R0)+,R2
1094  010254  004737  011400                  JSR     PC,LOADY
1095  010260  005002                          CLR     R2
1096  010262  004737  011400                  JSR     PC,LOADY
1097  010266  005301                          DEC     R1
1098  010270  001370                          BNE     NXTY1
1099  010272  104401  014005                  TYPE    ,C2             ;TYPE ASCIZ STRING
1100  010276  004737  010704                  JSR     PC,DELCLR
```

```
                                        ;CHANGE HISTOGRAM ERROR TO RELATIVE ACCURACY ERROR

                                RELACC: CLR     R1              ;RUNNING ERROR = 0
                                        CLR     R3              ;MAXIMUM ERROR = 0
                                        TYPE    ,MSG21
                                        MOV     #BUFFER+2,R0
                                NXTSTA: MOV     (R0),R2         ;STATE WIDTH = R2
                                        SUB     #800.,R2        ;STATE WIDTH ERROR IN R2
                                        ADD     R2,R1           ;UPDATE RUNNING ERROR
                                        MOV     R1,(R0)+        ;SAVE IN BUFFER
                                        MOV     R1,R4           ;SAVE IN R4 ALSO
                                        BPL     PLUS            ;IS IT POSITIVE?
                                        NEG     R4              ;NO - MAKE IT POSITIVE
                                PLUS:   CMP     R4,R3           ;CHECK AGAINST PREVIOUS MAX. ERROR
                                        BLE     NOTNEW          ;NOT A NEW MAXIMUM
                                        MOV     R4,R3           ;UPDATE MAXIMUM IN R3
                                        MOV     R0,R5
                                        SUB     #BUFFER+2,R5
                                        ASR     R5              ;R5=EDGE VALUE AT MAX. RELACC
                                NOTNEW: CMP     R0,#BUFFER+8190.  ;DONE?
                                        BNE     NXTSTA          ;NO - REPEAT
                                        ASR     R3              ;RESCALE FROM 1 LSB = 800. SCALING
                                        ASR     R3              ;TO 1 LSB = 100. SCALING
                                        ASR     R3
                                        ADC     R3
                                        MOV     R3,R2
                                        TYPDC
                                        TYPE    ,LINEA
                                        MOV     R5,-(SP)        ;;SAVE R5 FOR TYPEOUT
(1)                                                             ;;TYPE VALUE
(1)                                     TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)                                     .BYTE   4               ;;TYPE 4 DIGIT(S)
(1)                                     .BYTE   1               ;;TYPE LEADING ZEROS
                                        TYPE    ,SLASH                  ;PRINT '/'
                                        INC     R5
                                        MOV     R5,-(SP)        ;;SAVE R5 FOR TYPEOUT
(1)                                                             ;;TYPE VALUE
(1)                                     TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)                                     .BYTE   4               ;;TYPE 4 DIGIT(S)
(1)                                     .BYTE   1               ;;TYPE LEADING ZEROS
                                        CMP     R3,VLIN
                                        BLE     41$
                                        TYPE    ,ERMSG
                                        BR      42$
                                41$:    TYPE    ,OKMSG
                                42$:    TST     FLAG            ;VT55?
                                        BEQ     LO2
                                        MOV     #BUFFER,R0
                                        MOV     #4096.,R1
```

```
1144  010462  011002                GETDAT: MOV     (R0),R2         ;GET RELATIVE ACCURACY ERROR SCALED 1LSB = 800.
1145  010464  006202                        ASR     R2              ;RESCALE IT TO 1 LSB = 100.
1146  010466  006202                        ASR     R2
1147  010470  006202                        ASR     R2
1148  010472  005502                        ADC     R2
1149  010474  062702  000166              ADD     #118.,R2        ;AND MOVE IT TO MID-SCREEN
1150  010500  010220                      MOV     R2,(R0)+        ;PUT IT BACK INTO BUFFER
1151  010502  005301                      DEC     R1
1152  010504  001366                      BNE     GETDAT
1153  010506  012700  020034              MOV     #BUFFER,R0
1154  010512  012704  020034              MOV     #BUFFER,R4
1155  010516  012705  020036              MOV     #BUFFER+2,R5
1156  010522  012701  001000              MOV     #512.,R1
1157  010526  012702  000007      NXT8:   MOV     #7.,R2
1158  010532  012003                      MOV     (R0)+,R3
1159  010534  010337  001424              MOV     R3,MIN          ;MINIMUM
1160  010540  010337  001430              MOV     R3,MAX          ;MAXIMUM
1161  010544  012003              NXTCMP: MOV     (R0)+,R3
1162  010546  020337  001424              CMP     R3,MIN
1163  010552  002002                      BGE     MAXTST
1164  010554  010337  001424              MOV     R3,MIN          ;NEW MINIMUM
1165  010560  020337  001430      MAXTST: CMP     R3,MAX
1166  010564  003402                      BLE     TST8
1167  010566  010337  001430              MOV     R3,MAX          ;NEW MAXIMUM
1168  010572  005302              TST8:   DEC     R2
1169  010574  001363                      BNE     NXTCMP
1170  010576  013724  001424              MOV     MIN,(R4)+
1171  010602  013725  001430              MOV     MAX,(R5)+
1172  010606  022425                      CMP     (R4)+,(R5)+     ;BUMP EACH ONCE MORE
1173  010610  005301                      DEC     R1
1174  010612  001345                      BNE     NXT8
1175  010614  104401  013200              TYPE    ,MSG18
1176  010620  104401  014112              TYPE    ,BUFF2          ;TYPE BUFF2
1177  010624  012700  020034              MOV     #BUFFER,R0
1178  010630  004737  010662              JSR     PC,LOAD
1179  010634  104401  014012              TYPE    ,C3             ;TYPE ASCIZ STRING
1180  010640  012700  020036              MOV     #BUFFER+2,R0
1181  010644  004737  010662              JSR     PC,LOAD
1182  010650  104401  014005              TYPE    ,C2             ;TYPE ASCIZ STRING
1183  010654  004737  010704              JSR     PC,DELCLR
1184  010660  000207              LO2:    RTS     PC
1185  010662  012701  001000      LOAD:   MOV     #512.,R1
1186  010666  012002              LOAD0:  MOV     (R0)+,R2
1187  010670  005720                      TST     (R0)+
1188  010672  004737  011400              JSR     PC,LOADY
1189  010676  005301                      DEC     R1
1190  010700  001372                      BNE     LOAD0
1191  010702  000207                      RTS     PC
```

```
 1193  010704  032777  010000  170226  DELCLR: BIT     #BIT12,@SWR     ;TEST FOR HALT FOR DISPLAY
 1194  010712  001402                          BEQ     1$              ;;DON'T HALT FOR DISPLAY
 1195  010714  000000                          HALT
 1196  010716  000407                          BR      3$              ;;
 1197  010720  005000                  1$:     CLR     R0
 1198  010722  012701  000020                  MOV     #20,R1          ;DELAY BEFORE CLEANING SCREEN
 1199  010726  005300                  2$:     DEC     R0
 1200  010730  001376                          BNE     2$
 1201  010732  005301                          DEC     R1
 1202  010734  001374                          BNE     2$
 1203  010736  104401  014132          3$:     TYPE    ,VTINIT
 1204  010742  000207                          RTS     PC
 1205                                  ;;TYPE RMS AND PEAK VALUES;;
 1206  010744  104401  012241          TYPRP:  TYPE    ,NOI
 1207  010750  005737  001404                  TST     RMS
 1208  010754  100002                          BPL     POSRMS
 1209  010756  005037  001404                  CLR     RMS                     ;RMS<0,SET RMS=0
 1210  010762  005737  001406          POSRMS: TST     PEAK
 1211  010766  100002                          BPL     POSPEA
 1212  010770  005037  001406                  CLR     PEAK                    ;PEAK<0,SET PEAK=0
 1213  010774  013702  001404          POSPEA: MOV     RMS,R2
 1214  011000  104413                          TYPDC
 1215  011002  104401  013064                  TYPE    ,MESR           ;TYPE " LSB RMS, "
 1216  011006  013702  001406                  MOV     PEAK,R2
 1217  011012  104413                          TYPDC
 1218  011014  104401  013077                  TYPE    ,MESP           ;TYPE " LSB PEAK AT "
 1219  011020  004737  007100                  JSR     PC,TYPEDG
 1220  011024  104401  012251                  TYPE    ,CHAN           ;TYPE " ON CHANNEL "
 1221  011030  013746  001372                  MOV     CHANL,-(SP)     ;;SAVE CHANL FOR TYPEOUT
  (1)                                                                   ;;TYPE CHANL
  (1)  011034  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
  (1)  011036     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
  (1)  011037     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
 1222  011040  023737  001404  011662          CMP     RMS,VNR         ;WITHIN LIMITS?
 1223  011046  003007                          BGT     ER
 1224  011050  023737  001406  011664          CMP     PEAK,VNP                ;WITHIN LIMITS?
 1225  011056  003003                          BGT     ER
 1226  011060  104401  012303                  TYPE    ,OKMSG
 1227  011064  000207                          RTS     PC
 1228  011066  104401  012625          ER:     TYPE    ,ERMSG
 1229  011072  000207                          RTS     PC
```

```
                                        ;;ROUTINE TO AVERAGE 8 CONVERSIONS;;
011074  012500                  CONVRT: MOV     (R5)+,R0                ;GET CHANNEL VALUE
011076  063700  001342                  ADD     BASECH,R0
011102  010037  001372                  MOV     R0,CHANL
011106  000300                          SWAB    R0
011110  005037  001356                  CLR     TEMP
011114  010077  170176                  MOV     R0,@STREG               ;LOAD CHANNEL INTO MIX BITS
011120  012700  010000                  MOV     #10000,R0
011124  005300                  2$:     DEC     R0
011126  001376                          BNE     2$
011130  012777  001620  170166          MOV     #RETURN,@VECTOR         ;LOAD VECTOR
011136  012700  000010                  MOV     #10,R0          ;SET UP COUNTER
011142  152777  000101  170146  1$:     BISB    #101,@STREG             ;SET INTRPT. EN., START CONV.
011150  000001                          WAIT                    ;WAIT FOR CONVERSION
011152  067737  170144  001356          ADD     @ADBUFF,TEMP            ;READ BUFFER
011160  005300                          DEC     R0
011162  001367                          BNE     1$              ;DO 8 TIMES
011164  006237  001356                  ASR     TEMP            ;AVERAGE VALUE
011170  006237  001356                  ASR     TEMP
011174  006237  001356                  ASR     TEMP
011200  005537  001356                  ADC     TEMP
011204  000205                          RTS     R5              ;RETURN

                                        ;COMPARE $GDDAT AND $BDDAT;;
011206  012537  001124          COMPAR: MOV     (R5)+,$GDDAT            ;GET GOOD DATA
011212  013537  001412                  MOV     @(R5)+,SPREAD           ;GET SPREAD
011216  013737  001356  001126          MOV     TEMP,$BDDAT             ;GET BAD(ACTUAL) DATA
011224  013701  001126                  MOV     $BDDAT,R1
011230  013700  001124                  MOV     $GDDAT,R0
011234  160100                          SUB     R1,R0           ;GET DIFFERENCE
011236  100001                          BPL     7$
011240  005400                          NEG     R0
011242  020037  001412          7$:     CMP     R0,SPREAD               ;COMPARE IT TO SPREAD
011246  003001                          BGT     10$             ;GO TO ERROR PRINTOUT
011250  005725                          TST     (R5)+           ;BUMP RETURN POINTER AROUND ERROR CALL
011252  000205                  10$:    RTS     R5
```

```
1268                                        ;;SUBROUTINE TO TYPE INTRPT. TST MSG.;;
1269  011254  005737  001202          DUMW:  TST     $PASS
1270  011260  001021                        BNE     20$
1271  011262  012737  011324  001110        MOV     #20$,$LPERR
1272  011270  012737  011324  001106        MOV     #20$,$LPADR
1273  011276  104401  014042                TYPE    ,METST          ;TYPE ASCIZ STRING
1274  011302  010046                        MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
 (1)                                        ;;TYPE TEST NO.
 (1)  011304  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
 (1)  011306     002                        .BYTE   2               ;;TYPE 2 DIGIT(S)
 (1)  011307     000                        .BYTE   0               ;;SUPPRESS LEADING ZEROS
1275  011310  104401  013141                TYPE    ,ONAD
1276  011314  013746  001316                MOV     STREG,-(SP)     ;;SAVE STREG FOR TYPEOUT
 (1)                                        ;;TYPE BUS ADDRESS
 (1)  011320  104403                        TYPOS                   ;;GO TYPE--OCTAL ASCII
 (1)  011322     006                        .BYTE   6               ;;TYPE 6 DIGITS
 (1)  011323     001                        .BYTE   1               ;;TYPE LEADING ZEROS
1277  011324  000207                  20$:  RTS     PC
1278
1279  011326  005737  001202          DUMC:  TST     $PASS
1280  011332  001010                        BNE     30$
1281  011334  012737  011354  001110        MOV     #30$,$LPERR
1282  011342  012737  011354  001106        MOV     #30$,$LPADR
1283  011350  104401  012266                TYPE    ,DONE
1284  011354  000207                  30$:  RTS     PC
```

```
1286
1287  011356  000005                    ;SUBROUTINE TO RESET & SET INTRPT. EN.;
1288  011360  052777  000100  167556  RST:    RESET
1289  011366  005046                    BIS     #100,@$TKS
1290  011370  012746  011376            CLR     -(SP)           ;CLEAR PSW
1291  011374  000002                    MOV     #1$,-(SP)
1292  011376  000207                    RTI
1293                                1$:     RTS     PC
1294                                    ;SUBROUTINE LOADY;
1295  011400  005702                LOADY:  TST     R2              ;ROUTINE TO LOAD VLAUE INTO R2
1296  011402  100001                    BPL     PLUSR2          ;AS A VT55 Y-VALUE .
1297  011404  005002                    CLR     R2
1298  011406  020227  000353        PLUSR2: CMP     R2,#235.
1299  011412  002402                    BLT     LESS
1300  011414  012702  000353            MOV     #235.,R2
1301  011420  010203                LESS:   MOV     R2,R3
1302  011422  042702  177740            BIC     #177740,R2
1303  011426  052702  000040            BIS     #40,R2
1304  011432  105777  167512        B10:    TSTB    @$TPS           ;PRINT CHARACTER
1305  011436  100375                    BPL     B10
1306  011440  110277  167506            MOVB    R2,@$TPB
1307  011444  006203                    ASR     R3
1308  011446  006203                    ASR     R3
1309  011450  006203                    ASR     R3
1310  011452  006203                    ASR     R3
1311  011454  006203                    ASR     R3
1312  011456  042703  177770            BIC     #177770,R3
1313  011462  052703  000040            BIS     #40,R3
1314  011466  105777  167456        B11:    TSTB    @$TPS           ;PRINT CHARACTER
1315  011472  100375                    BPL     B11
1316  011474  110377  167452            MOVB    R3,@$TPB
1317  011500  000207                    RTS     PC
```

```
                                        ;;SUBROUTINE TO TYPE DECIMAL VALUE;;
                                        ;;IN R2 AS X.XX;;
011502  005702                  DECTYP: TST     R2              ;TEST VALUE TO BE TYPED
011504  100003                          BPL     POS
011506  104401  012103                  TYPE    ,MINUS                  ;TYPE MINUS SIGN
011512  005402                          NEG     R2
011514  020227  001747          POS:    CMP     R2,#999.                ;>999. REPLACE IT WITH 999.
011520  003402                          BLE     OKAYD
011522  012702  001747                  MOV     #999.,R2
011526  105037  014622          OKAYD:  CLRB    ONES            ;CLEAR ONES
011532  105037  014621                  CLRB    TENS            ;CLEAR TENS
011536  105037  014617                  CLRB    HUNS            ;CLEAR HUNS
011542  005702                  TESTR2: TST     R2                      ;CONVERT VALUE TO A DECIMAL VALUE
011544  001424                          BEQ     TYPOUT
011546  005302                          DEC     R2
011550  105237  014622                  INCB    ONES
011554  123727  014622  000012          CMPB    ONES,#10.
011562  001367                          BNE     TESTR2
011564  105037  014622                  CLRB    ONES
011570  105237  014621                  INCB    TENS
011574  123727  014621  000012          CMPB    TENS,#10.
011602  001357                          BNE     TESTR2
011604  105037  014621                  CLRB    TENS
011610  105237  014617                  INCB    HUNS
011614  000752                          BR      TESTR2
011616  152737  000060  014617  TYPOUT: BISB    #60,HUNS                ;PREPARE FOR TYPOUT
011624  152737  000060  014621          BISB    #60,TENS
011632  152737  000060  014622          BISB    #60,ONES
011640  104401  014617                  TYPE    ,HUNS           ;TYPE VALUE
011644  000002                          RTI
011646  000000                  V0:     0                       ;TOLERANCE VALUES FOR FUNCTIONAL TESTS
011650  000002                  V2:     2
011652  000004                  V4:     4
011654  000012                  V12:    12
011656  000062                  V50D:   50.
011660  000326                  V326:   326
                                
011662  000050                  VNR:    40.             ;.4 LSB,NORMAL LIMITS FOR SYSTEM
011664  000310                  VNP:    200.            ;2 LSB,  INTEGRATION AND FIELD USE ON SPEC TESTS
011666  000144                  VSET:   100.            ;1 LSB
011670  000175                  VLIN:   125.            ;1.25 LSB
011672  100000                          BIT15
                                
011674  052777  000100  167242  AGATST: BIS     #100,@$TKS
011702  000137                          JMP     @(PC)+
011704  001644                  AGTST:  BEGIN
```

```
                        .SBTTL  END OF PASS ROUTINE

                        ;;**********************************************************************
                        ;*INCREMENT THE PASS NUMBER ($PASS)
                        ;*IF THERES A MONITOR GO TO IT
                        ;*IF THERE ISN'T JUMP TO AGATST

011706                  $EOP:
011706  000240                NOP
011710  005037  001102        CLR     $TSTNM          ;;ZERO THE TEST NUMBER
011714  005037  001160        CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
011720  005237  001202        INC     $PASS           ;;INCREMENT THE PASS NUMBER
011724  042737  100000  001202  BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
011732  005327                DEC     (PC)+           ;;LOOP?
011734  000001          $EOPCT: .WORD   1
011736  003035                BGT     $DOAGN          ;;YES
011740  012737                MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
011742  000001          $ENDCT: .WORD   1
011744  011734                $EOPCT
011746  104401  011754        TYPE    ,65$            ;;TYPE ASCIZ STRING
011752  000414                BR      64$             ;;GET OVER THE ASCIZ
                        ;;65$:  .ASCIZ  <15><12>/ENDPASS  GOOD UNITS  /
012004                  64$:
012004  013746  001436        MOV     GUNITS,-(SP)    ;;SAVE GUNITS FOR TYPEOUT
012010  104405                TYPBN                   ;;GO TYPE--BINARY ASCII
012012  013700  000042  $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
012016  001405                BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
012020  000005                RESET                   ;;CLEAR THE WORLD
012022  004710          $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
012024  000240                NOP                     ;;SAVE ROOM
012026  000240                NOP                     ;;FOR
012030  000240                NOP                     ;;ACT11
012032                  $DOAGN:
012032  000137                JMP     @(PC)+          ;;RETURN
012034  011674          $RTNAD: .WORD   AGATST
012036    377     377   000   $ENULL: .BYTE   -1,-1,0          ;;NULL CHARACTER STRING
        012042                .EVEN
```

```
                                        .SBTTL          ASCII MESSAGES
012042  005015  047516  051511  NOIMSG: .ASCIZ  <15><12>/NOISE TEST/<15><12>
012050  020105  042524  052123
012056  005015     000
012061     015  051412  052105  SETMSG: .ASCIZ  <15><12>/SETTLING TEST/<15><12>
012066  046124  047111  020107
012074  042524  052123  005015
012102     000
012103     055     000          MINUS:  .BYTE   55,0
012105     077     000          QUEST:  .BYTE   77,0
012107     136     101     040  AMSG:   .BYTE   136,101,40,40,0
012112     040     000
012114     136     103     040  CMSG:   .BYTE   136,103,40,40,0
012117     040     000
012121     136     107     015  GMSG:   .BYTE   136,107,15,12,123,127,122,105,107,72,0
012124     012     123     127
012127     122     105     107
012132     072     000
012134  046040  041123  005015  LSBMSG: .ASCIZ  / LSB/<15><12>
012142     000
012143     055  020055     000  DASH:   .ASCIZ  /-- /
012147     123  040524  042524  STATE:  .ASCIZ  /STATE-- WIDTH/<15><12>
012154  026455  053440  042111
012162  044124  005015     000
012167     103  000110          CH:     .ASCIZ  /CH/
012172  020040  020040     000  SPACE:  .ASCIZ  /    /
012177     040  051514  020102  LSB:    .ASCIZ  / LSB ON CH/
012204  047117  041440  000110
012212  051440  052105  046124  SETCH:  .ASCIZ  / SETTLING FROM CH/
012220  047111  020107  051106
012226  046517  041440  000110
012234  040440  020124     000  ATMSG:  .ASCIZ  / AT /
012241     116  044517  042523  NOI:    .ASCIZ  /NOISE: /
012246  020072     000
012251     040  047117  041440  CHAN:   .ASCIZ  / ON CHANNEL /
012256  040510  047116  046105
012264  000040
012266  020040  020040  047504  DONE:   .ASCIZ  /    DONE/<15><12>
012274  042516  005015     000
012301     057     000          SLASH:  .ASCIZ  #/#
012303     040  020040  047440  OKMSG:  .ASCIZ  /    OK/<15><12>
012310  006513  000012
012314  005015  054524  042520  CCHAN:  .ASCIZ  <15><12>/TYPE CHANNEL & CR: /
012322  041440  040510  047116
012330  046105  023040  041440
012336  035122  000040
012342  005015  054524  042520  SEL:    .ASCIZ  <15><12>/TYPE "O" FOR OFFSET, "G" FOR GAIN & CR: /
012350  021040  021117  043040
012356  051117  047440  043106
012364  042523  026124  021040
012372  021107  043040  051117
012400  043440  044501  020116
012406  020046  051103  020072
012414     000
```

```
 1392  012415     015  040412  045104  XADJ:   .ASCII  <15><12>/ADJUST R15/
       012422  051525  020124  030522
       012430     065
 1393  012431     040  047506  020122  MOLSB:  .ASCIZ  / FOR 0.00 LSB ERROR/
       012436  027060  030060  046040
       012444  041123  042440  051122
       012452  051117     000
 1394  012455     015  044412  050116  IGND:   .ASCII  <15><12>/INPUT A GROUND ON THE CHANNEL/
       012462  052125  040440  043440
       012470  047522  047125  020104
       012476  047117  052040  042510
       012504  041440  040510  047116
       012512  046105
 1395  012514  005015  054524  042520  CRWR:   .ASCIZ  <15><12>/TYPE CR WHEN READY/<15><12>
       012522  041440  020122  044127
       012530  047105  051040  040505
       012536  054504  005015     000
 1396  012543     015  044412  050116  IVOLT:  .ASCIZ  <15><12>/INPUT +5.115 VOLTS ON THE CHANNEL/
       012550  052125  025440  027065
       012556  030461  020065  047526
       012564  052114  020123  047117
       012572  052040  042510  041440
       012600  040510  047116  046105
       012606     000
 1397  012607     015  040412  045104  YADJ:   .ASCIZ  <15><12>/ADJUST R3/
       012614  051525  020124  031522
       012622     000
 1398  012623     053     000          POSITV: .ASCIZ  /+/
 1399  012625     040  025052  051105  ERMSG:  .ASCIZ  / **ERROR**/<15><12>
       012632  047522  025122  006452
       012640  000012
 1400  012642  051440  044513  050120  SKPMSG: .ASCIZ  / SKIPPED STATE(S)/
       012650  042105  051440  040524
       012656  042524  051450  000051
 1401  012664  047040  051101  047522  NARMSG: .ASCIZ  # NARROW (< 1/2 LSB) STATE(S)#<15><12>
       012672  020127  036050  030440
       012700  031057  046040  041123
       012706  020051  052123  052101
       012714  024105  024523  005015
       012722     000
 1402  012723     040  044527  042504  WIDMSG: .ASCIZ  # WIDE (> 1 1/2 LSB) STATE(S)#<15><12>
       012730  024040  020076  020061
       012736  027461  020062  051514
       012744  024502  051440  040524
       012752  042524  051450  006451
       012760  000012
 1403  012762  051440  040524  042524  OUTMSG: .ASCIZ  / STATE(S) WIDER THAN 2 LSB/
       012770  051450  020051  044527
       012776  042504  020122  044124
       013004  047101  031040  046040
       013012  041123     000
```

```
 1405  013015   040   052123  052101  HAFMSG: .ASCIZ  # STATE-WIDTH(S) OUTSIDE + OR - 1/2 LSB#
       013022  026505  044527  052104
       013030  024110  024523  047440
       013036  052125  044523  042504
       013044  025440  047440  020122
       013052  020055  027461  020062
       013060  051514  000102
 1406  013064  046040  041123  051040  MESR:   .ASCIZ  / LSB RMS, /
       013072  051515  020054    000
 1407  013077   040   051514  020102  MESP:   .ASCIZ  / LSB PEAK AT /
       013104  042520  045501  040440
       013112  020124    000
 1408  013115   015   042412  042116  MEND:   .ASCII  <15><12>/END OF LOGIC TESTS/
       013122  047440  020106  047514
       013130  044507  020103  042524
       013136  052123    123
 1409  013141   040   047117  040440  ONAD:   .ASCIZ  / ON ADV11 AT /
       013146  053104  030461  040440
       013154  020124    000
 1410  013157   040   042101  030526  MSG50:  .ASCIZ  / ADV11'S FOUND/<15><12>
       013164  023461  020123  047506
       013172  047125  006504  000012
 1411  013200  005012  025412  027461  MSG18:  .ASCII  <12><12><12>#+1/2 LSB#<15><12><12><12><12><12><12><12><12><12><12><12><12><1
       013206  020062  051514  006502
       013214  005012  005012  005012
       013222  005012  005012  005012
 1412  013230  030455  031057  051514          .ASCIZ  \-1/2LSB\
       013236  000102
 1413
 1414                                          .EVEN
 1415  013240  044504  043106  051105  MSG20:  .ASCIZ  /DIFFERENTIAL LINEARITY:/<15><12>
       013246  047105  044524  046101
       013254  046040  047111  040505
       013262  044522  054524  006472
       013270  000012
```

```
 1417  013272  020040  020040  020040  MSG16:  .ASCII  /                    STATE-WIDTH DISTRIBUTION/<15><12><12><12>
       013300  020040  020040  020040
       013306  020040  020040  020040
       013314  020040  052123  052101
       013322  026505  044527  052104
       013330  020110  044504  052123
       013336  044522  052502  044524
       013344  047117  005015  005012
 1418  013352  020040  020043  043117          .ASCII  /  # OF STATES/<12><12><12><12><12><12><12><12><12><12><12><12><12><12><
       013360  051440  040524  042524
       013366  005123  005012  005012
       013374  005012  005012  005012
       013402  005012  005012  005012
       013410  005012
 1419  013412  020040  020040  020040          .ASCII  /                                                STATE WIDTH (LSB)/<15>
       013420  020040  020040  020040
       013426  020040  020040  020040
       013434  020040  020040  020040
       013442  020040  020040  020040
       013450  020040  020040  020040
       013456  020040  020040  020040
       013464  020040  020040  020040
       013472  051440  040524  042524
       013500  053440  042111  044124
       013506  024040  051514  024502
       013514  005015
 1420  013516  030040  020040  020040          .ASCIZ  # 0              1/2              1              1 1/2              2#
       013524  020040  020040  020040
       013532  020040  020040  027461
       013540  020062  020040  020040
       013546  020040  020040  020040
       013554  020040  020061  020040
       013562  020040  020040  020040
       013570  020040  030440  030440
       013576  031057  020040  020040
       013604  020040  020040  020040
       013612  020040  031040     000
 1421  013617     015  052012  050131  MSG71:  .ASCIZ  <15><12>/TYPE LETTER & CR FOR TEST: /
       013624  020105  042514  052124
       013632  051105  023040  041440
       013640  020122  047506  020122
       013646  042524  052123  020072
       013654     000
 1422  013655     122  046105  052101  MSG21:  .ASCIZ  /RELATIVE ACCURACY:/<15><12>
       013662  053111  020105  041501
       013670  052503  040522  054503
       013676  006472  000012
 1423  013702  046040  041123  046440  LINEA:  .ASCIZ  / LSB MAXIMUM AT /
       013710  054101  046511  046525
       013716  040440  020124     000
 1424  013723     015  050012  044522  HEAD5:  .ASCII  <15><12>/PRINT VALUES--/
       013730  052116  053040  046101
       013736  042525  026523     055
```

```
1426  013743  040     042523  020124  ASKCH:  .ASCIZ  / SET CHANNEL IN SWR LOW BYTE/<15><12>
      013750  044103  047101  042516
      013756  020114  047111  051440
      013764  051127  046040  053517
      013772  041040  052131  006505
      014000  000012
1427  014002  055033  000             C0:     .ASCIZ  <33><132>
1428  014005  033     015462  000110  C2:     .ASCIZ  <33><62><33><110>       ;CLEAR GRAPH MODE AND HOME
1429  014012  000112                  C3:     .ASCIZ  <112>
1430  014014  005015  043117  051506  MOFSET: .ASCIZ  <15><12>/OFFSET =/
      014022  052105  036440  000
1431  014027  040     051514  020102  MLSB:   .ASCIZ  / LSB /
      014034  000
1432  014035  040     052101  000040  MAT:    .ASCIZ  / AT /
1433  014042  005015  042440  052116  METST:  .ASCIZ  <15><12>/ ENTERING TEST /
      014050  051105  047111  020107
      014056  042524  052123  000040
1434  014064  033     061     101     BUFF1:  .BYTE   33,61,101,61,111,62,114,41,60,45,63,51,66,55,71,61,74,110,41,40,112,0
      014067  061     111     062
      014072  114     041     060
      014075  045     063     051
      014100  066     055     071
      014103  061     074     110
      014106  041     040     112
      014111  000
1435  014112  033     061     101     BUFF2:  .BYTE   33,61,101,47,111,61,104,50,65,44,62,110,40,40,102,0
      014115  047     111     061
      014120  104     050     065
      014123  044     062     110
      014126  040     040     102
      014131  000
1436  014132  033     110     033     VTINIT: .BYTE   33,110,33,112,33,61,101,40,33,62,0      ;HOME & ERASE SCREEN & CLEAR GRA
      014135  112     033     061
      014140  101     040     033
      014143  062     000
```

```
1438  014145  015     005012  042115  HEAD1:  .ASCII  <15><12><12>/ D-11-CVADA-C    ADV11 DIAGNOSTIC/<15><12>
      014152  030455  026461  053103
      014160  042101  026501  020103
      014166  020040  040440  053104
      014174  030461  042040  040511
      014202  047107  051517  044524
      014210  006503  012
1439  014213  012     035101  040440          .ASCII  <12>/A: AUTO TEST/
      014220  052125  020117  042524
      014226  052123
1440  014230  005015  035103  041440          .ASCII  <15><12>/C: CALIBRATION/
      014236  046101  041111  040522
      014244  044524  047117
1441  014250  005015  035120  050040          .ASCII  <15><12>/P: PRINT VALUES/
      014256  044522  052116  053040
      014264  046101  042525  123
1442  014271  015     046012  020072          .ASCII  <15><12>/L: LOGIC/
      014276  047514  044507  103
1443  014303  015     053412  020072          .ASCIZ  <15><12>/W: WRAPAROUND/<15><12>
      014310  051127  050101  051101
      014316  052517  042116  005015
      014324  000
1444  014325  123     040524  052524  EM1:    .ASCIZ  /STATUS REG. ERROR/
      014332  020123  042522  027107
      014340  042440  051122  051117
      014346  000
1445  014347  106     044501  042514  EM2:    .ASCIZ  /FAILED TO INTERRUPT/
      014354  020104  047524  044440
      014362  052116  051105  052522
      014370  052120  000
1446  014373  125     042516  050130  EM3:    .ASCIZ  /UNEXPECTED INTERRUPT/
      014400  041505  042524  020104
      014406  047111  042524  051122
      014414  050125  000124
1447  014420  051105  047522  020122  EM4:    .ASCIZ  #ERROR ON A/D CHANNEL#
      014426  047117  040440  042057
      014434  041440  040510  047116
      014442  046105  000
```

```
 1449  014445     105  051122  041520  DH1:    .ASCIZ  /ERRPC STREG EXPECTED ACTUAL/
       014452  051440  051124  043505
       014460  042440  050130  041505
       014466  042524  020104  041501
       014474  052524  046101     000
 1450  014501     105  051122  041520  DH2:    .ASCIZ  /ERRPC  STREG   CHANNEL  NOMINAL  TOLERANCE  ACTUAL/
       014506  020040  052123  042522
       014514  020107  020040  044103
       014522  047101  042516  020114
       014530  047040  046517  047111
       014536  046101  020040  047524
       014544  042514  040522  041516
       014552  020105  040440  052103
       014560  040525  000114
 1451  014564  051105  050122  020103  DH3:    .ASCIZ  /ERRPC      STREG    ACTUAL/
       014572  020040  020040  051440
       014600  051124  043505  020040
       014606  020040  041501  052524
       014614  046101     000
 1452  014617     000                  HUNS:   .BYTE   0
 1453  014620     056                  DECPNT: .BYTE   56
 1454  014621     000                  TENS:   .BYTE   0
 1455  014622     000     000          ONES:   .BYTE   0,0
 1456                                  .EVEN
 1457
 1458  014624  001116  001316  001124  DT1:    $ERRPC, STREG, $GDDAT, $BDDAT,0
       014632  001126  000000
 1459  014636  001116  001316  001372  DT2:    $ERRPC,STREG,CHANL,$GDDAT,SPREAD,$BDDAT,0
       014644  001124  001412  001126
       014652  000000
 1460  014654  001116  001316  001126  DT3:    $ERRPC,STREG,$BDDAT,0
       014662  000000
 1461  014664  000000                  DF1:    0
```

```
                        .SBTTL  TTY INPUT ROUTINE

                        ;;*******************************************************************
                        .ENABL  LSB

                        .DSABL  LSB


                        ;;*******************************************************************
                        ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
                        ;*CALL:
                        ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
                        ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
                        ;*                              ;;WITH PARITY BIT STRIPPED OFF
                        ;

014666  011646          $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
014670  016666  000004  000002  MOV     4(SP),2(SP)     ;;SAVE THE PS
014676  105777  164242  1$:     TSTB    @$TKS           ;;WAIT FOR
014702  100375                  BPL     1$              ;;A CHARACTER
014704  117766  164236  000004  MOVB    @$TKB,4(SP)     ;;READ THE TTY
014712  042766  177600  000004  BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
014720  026627  000004  000023  CMP     4(SP),#23       ;;IS IT A CONTROL-S?
014726  001013                  BNE     3$              ;;BRANCH IF NO
014730  105777  164210  2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
014734  100375                  BPL     2$              ;;LOOP UNTIL ITS THERE
014736  117746  164204          MOVB    @$TKB,-(SP)     ;;GET CHARACTER
014742  042716  177600          BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
014746  022627  000021          CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
014752  001366                  BNE     2$              ;;IF NOT DISCARD IT
014754  000750                  BR      1$              ;;YES, RESUME
014756  026627  000004  000140  3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
014764  002407                  BLT     4$              ;;BRANCH IF YES
014766  026627  000004  000175  CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
014774  003003                  BGT     4$              ;;BRANCH IF YES
014776  042766  000040  000004  BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
015004  000002          4$:     RTI                     ;;GO BACK TO USER
                        ;;*******************************************************************
                        ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
                        ;*CALL:
                        ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
                        ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
                        ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S

015006  010346          $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
015010  012703  015114  1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
015014  022703  015124  2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
015020  101405                  BLOS    4$              ;;BR IF YES
015022  104406                  RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
015024  112613                  MOVB    (SP)+,(R3)      ;;GET CHARACTER
015026  122713  000177  10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
015032  001003                  BNE     3$              ;;SKIP IF NOT
015034  104401  001170  4$:     TYPE    ,$QUES          ;;TYPE A '?'
015040  000763                  BR      1$              ;;CLEAR THE BUFFER AND LOOP
015042  111337  015112  3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
015046  104401  015112          TYPE    ,9$
```

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(1)  015052  122723  000015                    CMPB    #15,(R3)+       ;;CHECK FOR RETURN
(1)  015056  001356                            BNE     2$              ;;LOOP IF NOT RETURN
(1)  015060  105063  177777                    CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
(1)  015064  104401  001172                    TYPE    ,$LF            ;;TYPE A LINE FEED
(1)  015070  012603                            MOV     (SP)+,R3        ;;RESTORE R3
(1)  015072  011646                            MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
(1)  015074  016666  000004  000002            MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
(1)  015102  012766  015114  000004            MOV     #$TTYIN,4(SP)
(1)  015110  000002                            RTI                     ;;RETURN
(1)  015112     000                 9$:        .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
(1)  015113     000                            .BYTE   0               ;;TERMINATOR
(1)  015114  000010              $TTYIN:       .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
(1)  015124  052536  005015  000  $CNTLU:       .ASCIZ  /^U/<15><12>    ;;CONTROL "U"
(1)  015131     136  006507  000012  $CNTLG:    .ASCIZ  /^G/<15><12>    ;;CONTROL "G"
(1)  015136  005015  053523  020122  $MSWR:     .ASCIZ  <15><12>/SWR = /
(1)  015144  020075     000
(1)  015147     040  047040  053505  $MNEW:     .ASCIZ  /  NEW = /
(1)  015154  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.
                                ;*CALL:
                                ;*      RDOCT                   ;;READ AN OCTAL NUMBER
                                ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
                                ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT

015160  011646                  $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
015162  016666  000004  000002          MOV     4(SP),2(SP)     ;;INPUT NUMBER
015170  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
015172  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
015174  010246                          MOV     R2,-(SP)        ;;PUSH R2 ON STACK
015176  104407                  1$:     RDLIN                   ;;READ AN ASCIZ LINE
015200  012600                          MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
015202  005001                          CLR     R1              ;;CLEAR DATA WORD
015204  005002                          CLR     R2
015206  112046                  2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
015210  001412                          BEQ     3$              ;;IF ZERO GET OUT
015212  006301                          ASL     R1              ;;*2
015214  006102                          ROL     R2
015216  006301                          ASL     R1              ;;*4
015220  006102                          ROL     R2
015222  006301                          ASL     R1              ;;*8
015224  006102                          ROL     R2
015226  042716  177770                  BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
015232  062601                          ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
015234  000764                          BR      2$              ;;LOOP
015236  005726                  3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
015240  010166  000012                  MOV     R1,12(SP)       ;;SAVE THE RESULT
015244  010237  015260                  MOV     R2,$HIOCT
015250  012602                          MOV     (SP)+,R2        ;;POP STACK INTO R2
015252  012601                          MOV     (SP)+,R1        ;;POP STACK INTO R1
015254  012600                          MOV     (SP)+,R0        ;;POP STACK INTO R0
015256  000002                          RTI                     ;;RETURN
015260  000000                  $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
                                .SBTTL  SCOPE HANDLER ROUTINE

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

  (1)  015262                   $SCOPE:
  (1)  015262  032777  040000  163650  1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
  (1)  015270  001114                         BNE     $OVER           ;;YES IF SW14=1
  (1)                           ;#####START OF CODE FOR THE XOR TESTER#####
  (1)  015272  000416           $XTSTR: BR      6$                      ;;IF RUNNING ON THE "XOR" TESTER CHANGE
  (1)                                                                   ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
  (1)  015274  013746  000004                 MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
  (1)  015300  012737  015320  000004         MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
  (1)  015306  005737  177060                 TST     @#177060        ;;TIME OUT ON XOR?
  (1)  015312  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
  (1)  015316  000463                         BR      $SVLAD          ;;GO TO THE NEXT TEST
  (1)  015320  022626           5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
  (1)  015322  012637  000004                 MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
  (1)  015326  000423                         BR      7$              ;;LOOP ON THE PRESENT TEST
  (1)  015330                   6$:;#####END OF CODE FOR THE XOR TESTER#####
  (1)  015330  032777  000400  163602         BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
  (1)  015336  001404                         BEQ     2$              ;;BR IF NO
  (1)  015340  127737  163574  001102         CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
  (1)  015346  001465                         BEQ     $OVER           ;;BR IF YES
  (1)  015350  105737  001103           2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
  (1)  015354  001421                         BEQ     3$              ;;BR IF NO
  (1)  015356  123737  001115  001103         CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
  (1)  015364  101015                         BHI     3$              ;;BR IF NO
  (1)  015366  032777  001000  163544         BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
  (1)  015374  001404                         BEQ     4$              ;;BR IF NO
  (1)  015376  013737  001110  001106  7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
  (1)  015404  000446                         BR      $OVER
  (1)  015406  105037  001103           4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
  (1)  015412  005037  001160                 CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
  (1)  015416  000415                         BR      1$              ;;ESCAPE TO THE NEXT TEST
  (1)  015420  032777  004000  163512  3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
  (1)  015426  001011                         BNE     1$              ;;BR IF YES
  (1)  015430  005737  001202                 TST     $PASS           ;;IF FIRST PASS OF PROGRAM
  (1)  015434  001406                         BEQ     1$              ;;      INHIBIT ITERATIONS
  (1)  015436  005237  001104                 INC     $ICNT           ;;INCREMENT ITERATION COUNT
  (1)  015442  023737  001160  001104         CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
  (1)  015450  002024                         BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
  (1)  015452  012737  000001  001104  1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
  (1)  015460  013737  015536  001160         MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
  (1)  015466  105237  001102           $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
  (1)  015472  113737  001102  001200         MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
  (1)  015500  011637  001106                 MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
```

```
(1)  015504  011637  001110                MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
(1)  015510  005037  001162                CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
(1)  015514  112737  000001  001115        MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
(1)  015522  013777  001102  163412 $OVER: MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
(1)  015530  013716  001106                MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
(1)  015534  000002                        RTI                     ;;FIXES PS
(1)  015536  003720                $MXCNT: 2000.                   ;;MAX. NUMBER OF ITERATIONS
1468                                       .SBTTL  ERROR HANDLER ROUTINE
(1)
(2)                                        ;;**********************************************************************
(1)                                        ;*THIS ROUTINE WILL INCREMENT THE ERROR FLAG AND THE ERROR COUNT,
(1)                                        ;*SAVE THE ERROR ITEM NUMBER AND THE ADDRESS OF THE ERROR CALL
(1)                                        ;*AND GO TO $ERRTYP ON ERROR
(1)                                        ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
(1)                                        ;*SW15=1        HALT ON ERROR
(1)                                        ;*SW13=1        INHIBIT ERROR TYPEOUTS
(1)                                        ;*SW10=1        BELL ON ERROR
(1)                                        ;*SW09=1        LOOP ON ERROR
(1)                                        ;*CALL
(1)                                        ;*      ERROR   N       ;;ERROR=EMT AND N=ERROR ITEM NUMBER
(1)
(1)  015540                        $ERROR:
(3)  015540  043737  001440  001436        BIC     TSTBIT,GUNITS
(1)  015546  105237  001103        7$:     INCB    $ERFLG          ;;SET THE ERROR FLAG
(1)  015552  001775                        BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
(1)  015554  013777  001102  163360        MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
(1)  015562  032777  002000  163350        BIT     #BIT10,@SWR     ;;BELL ON ERROR?
(1)  015570  001402                        BEQ     1$              ;;NO - SKIP
(1)  015572  104401  001164                TYPE    ,$BELL          ;;RING BELL
(1)  015576  005237  001112        1$:     INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
(1)  015602  011637  001116                MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
(1)  015606  162737  000002  001116        SUB     #2,$ERRPC
(1)  015614  117737  163276  001114        MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
(1)  015622  032777  020000  163310        BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
(1)  015630  001004                        BNE     20$             ;;SKIP TYPEOUTS
(1)  015632  004737  015742                JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
(1)  015636  104401  001171                TYPE    ,$CRLF
(1)  015642                        20$:
(1)  015642  122737  000001  001214        CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
(1)  015650  001007                        BNE     2$              ;;NO,SKIP APT ERROR REPORT
(1)  015652  113737  001114  015664        MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
(1)  015660  004737  016376                JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
(1)  015664     000                21$:    .BYTE   0
(1)  015665     000                        .BYTE   0
(1)  015666  000777                22$:    BR      2$              ;;APT ERROR LOOP
(1)  015670  005777  163244        2$:     TST     @SWR            ;;HALT ON ERROR
(1)  015674  100001                        BPL     3$              ;;SKIP IF CONTINUE
(1)  015676  000000                        HALT                    ;;HALT ON ERROR!
(1)  015700  032777  001000  163232  3$:    BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
(1)  015706  001402                        BEQ     4$              ;;BR IF NO
(1)  015710  013716  001110                MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
(1)  015714  005737  001162        4$:     TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
(1)  015720  001402                        BEQ     5$              ;;BR IF NONE
(1)  015722  013716  001162                MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
(1)  015726                        5$:
(1)  015726  022737  012022  000042        CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
```

```
(1)  015734  001001                    BNE     6$              ;;BRANCH IF NO
(1)  015736  000000                    HALT                    ;;YES
(1)  015740                         6$:
(1)  015740  000002                    RTI                     ;;RETURN
1469                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE
(1)
(2)                                 ;;**********************************************************************
(1)                                 ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($ITEMB) TO DETERMINE WHICH
(1)                                 ;*ERROR IS TO BE REPORTED. IT THEN OBTAINS, FROM THE "ERROR TABLE" ($ERRTB),
(1)                                 ;*AND REPORTS THE APPROPRIATE INFORMATION CONCERNING THE ERROR.
(1)
(1)  015742                         $ERRTYP:
(1)  015742  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  015746  010046                    MOV     R0,-(SP)        ;;SAVE R0
(1)  015750  005000                    CLR     R0              ;;PICKUP THE ITEM INDEX
(1)  015752  153700  001114            BISB    @#$ITEMB,R0
(1)  015756  001004                    BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
(1)                                                            ;;TYPE THE PC OF THE ERROR
(2)  015760  013746  001116            MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
(2)                                                            ;;ERROR ADDRESS
(2)  015764  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
(1)  015766  000426                    BR      6$              ;;GET OUT
(1)  015770  005300                 1$:DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
(1)  015772  006300                    ASL     R0              ;;      WORK FOR THE ERROR TABLE
(1)  015774  006300                    ASL     R0
(1)  015776  006300                    ASL     R0
(1)  016000  062700  001256            ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
(1)  016004  012037  016014            MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
(1)  016010  001404                    BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
(1)  016012  104401                    TYPE                    ;;TYPE THE "ERROR MESSAGE"
(1)  016014  000000                 2$:.WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
(1)  016016  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  016022  012037  016032         3$:MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
(1)  016026  001404                    BEQ     5$              ;;SKIP TYPEOUT IF 0
(1)  016030  104401                    TYPE                    ;;TYPE THE "DATA HEADER"
(1)  016032  000000                 4$:.WORD   0               ;;"DATA HEADER" POINTER GOES HERE
(1)  016034  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  016040  011000                 5$:MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
(1)  016042  001004                    BNE     7$              ;;GO TYPE THE DATA
(1)  016044  012600                 6$:MOV     (SP)+,R0        ;;RESTORE R0
(1)  016046  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  016052  000207                    RTS     PC              ;;RETURN
(1)  016054                         7$:
(2)  016054  013046                    MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
(2)  016056  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
(1)  016060  005710                    TST     (R0)            ;;IS THERE ANOTHER NUMBER?
(1)  016062  001770                    BEQ     6$              ;;BR IF NO
(1)  016064  104401  016072            TYPE    ,8$             ;;TYPE TWO(2) SPACES
(1)  016070  000771                    BR      7$              ;;LOOP
(1)  016072  020040      000       8$:.ASCIZ  /  /            ;;TWO(2) SPACES
(1)          016076                    .EVEN
```

```
                                .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
                                ;*

016076  105737  001157          $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
016102  100002                         BPL     1$              ;;BR IF YES
016104  000000                         HALT                    ;;HALT HERE IF NO TERMINAL
016106  000430                         BR      3$              ;;LEAVE
016110  010046                  1$:    MOV     R0,-(SP)        ;;SAVE R0
016112  017600  000002                 MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
016116  122737  000001  001214         CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
016124  001011                         BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
016126  132737  000100  001215         BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
016134  001405                         BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
016136  010037  016146                 MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
016142  004737  016366                 JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
016146  000000                  61$:   .WORD   0               ;;MESSAGE ADDRESS
016150  132737  000040  001215  62$:   BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
016156  001003                         BNE     60$             ;;YES,SKIP TYPE OUT
016160  112046                  2$:    MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
016162  001005                         BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
016164  005726                         TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
016166  012600                  60$:   MOV     (SP)+,R0        ;;RESTORE R0
016170  062716  000002          3$:    ADD     #2,(SP)         ;;ADJUST RETURN PC
016174  000002                         RTI                     ;;RETURN
016176  122716  000011          4$:    CMPB    #HT,(SP)        ;;BRANCH IF <HT>
016202  001430                         BEQ     8$
016204  122716  000200                 CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
016210  001006                         BNE     5$
016212  005726                         TST     (SP)+           ;;POP  <CR><LF> EQUIV
016214  104401                         TYPE                    ;;TYPE A CR AND LF
016216  001171                         $CRLF
016220  105037  016354                 CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
016224  000755                         BR      2$              ;;GET NEXT CHARACTER
016226  004737  016310          5$:    JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
016232  123726  001156          6$:    CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
016236  001350                         BNE     2$              ;;IF NO GO GET NEXT CHAR.
016240  013746  001154                 MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
                                                               ;;AND THE NULL CHAR.
016244  105366  000001          7$:    DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
016250  002770                         BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
016252  004737  016310                 JSR     PC,$TYPEC       ;;GO TYPE A NULL
016256  105337  016354                 DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
```

```
   (1)  016262  000770                        BR      7$              ;;LOOP
   (1)
   (1)                                ;HORIZONTAL TAB PROCESSOR
   (1)
   (1)  016264  112716  000040          8$:   MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
   (1)  016270  004737  016310          9$:   JSR     PC,$TYPEC       ;;TYPE A SPACE
   (1)  016274  132737  000007  016354        BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
   (1)  016302  001372                        BNE     9$              ;;TAB STOP
   (1)  016304  005726                        TST     (SP)+           ;;POP SPACE OFF STACK
   (1)  016306  000724                        BR      2$              ;;GET NEXT CHARACTER
   (1)  016310  105777  162634          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
   (1)  016314  100375                        BPL     $TYPEC
   (1)  016316  116677  000002  162626        MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
   (1)  016324  122766  000015  000002        CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
   (1)  016332  001003                        BNE     1$              ;;BRANCH IF NO
   (1)  016334  105037  016354                CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
   (1)  016340  000406                        BR      $TYPEX          ;;EXIT
   (1)  016342  122766  000012  000002  1$:   CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
   (1)  016350  001402                        BEQ     $TYPEX          ;;BRANCH IF YES
   (1)  016352  105227                        INCB    (PC)+           ;;COUNT THE CHARACTER
   (1)  016354  000000          $CHARCNT:.WORD  0                       ;;CHARACTER COUNT STORAGE
   (1)  016356  000207          $TYPEX: RTS     PC
   (1)
  1472                                .SBTTL  APT COMMUNICATIONS ROUTINE
   (1)
   (2)                                ;;**********************************************************************
   (1)                                ;;**********************************************************************
   (1)  016360  112737  000001  016624  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
   (1)  016366  112737  000001  016622  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
   (1)  016374  000403                        BR      $ATYC
   (1)  016376  112737  000001  016624  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
   (1)  016404                        $ATYC:
   (3)  016404  010046                        MOV     R0,-(SP)        ;;PUSH R0 ON STACK
   (3)  016406  010146                        MOV     R1,-(SP)        ;;PUSH R1 ON STACK
   (1)  016410  105737  016622                TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
   (1)  016414  001450                        BEQ     5$              ;;IF NOT:  BR
   (1)  016416  122737  000001  001214        CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
   (1)  016424  001031                        BNE     3$              ;;IF NOT:  BR
   (1)  016426  132737  000100  001215        BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
   (1)  016434  001425                        BEQ     3$              ;;IF NOT:  BR
   (1)  016436  017600  000004                MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
   (1)  016442  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
   (1)  016450  005737  001174          1$:   TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
   (1)  016454  001375                        BNE     1$              ;;IF NOT:  WAIT
   (1)  016456  010037  001210                MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
   (1)  016462  105720                  2$:   TSTB    (R0)+           ;;FIND END OF MESSAGE
   (1)  016464  001376                        BNE     2$
   (1)  016466  163700  001210                SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
   (1)  016472  006200                        ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
   (1)  016474  010037  001212                MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
   (1)  016500  012737  000004  001174        MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
   (1)  016506  000413                        BR      5$
   (1)  016510  017637  000004  016534  3$:   MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
   (1)  016516  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS.
   (3)  016524  013746  177776                MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
   (1)  016530  004737  016076                JSR     PC,$TYPE        ;;CALL TYPE MACRO
   (1)  016534  000000                  4$:   .WORD   0
```

```
(1)  016536                          5$:
(1)  016536  105737  016624         10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
(1)  016542  001416                         BEQ     12$             ;;IF NOT:  BR
(1)  016544  005737  001214                 TST     $ENV            ;;RUNNING UNDER APT?
(1)  016550  001413                         BEQ     12$             ;;IF NOT:  BR
(1)  016552  005737  001174         11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
(1)  016556  001375                         BNE     11$             ;;IF NOT:  WAIT
(1)  016560  017637  000004  001176        MOV     @4(SP),$FATAL   ;;GET ERROR #
(1)  016566  062766  000002  000004        ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
(1)  016574  005237  001174                 INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
(1)  016600  105037  016624         12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
(1)  016604  105037  016623                 CLRB    $LFLG           ;;CLEAR LOG FLAG
(1)  016610  105037  016622                 CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
(3)  016614  012601                         MOV     (SP)+,R1        ;;POP STACK INTO R1
(3)  016616  012600                         MOV     (SP)+,R0        ;;POP STACK INTO R0
(1)  016620  000207                         RTS     PC              ;;RETURN
(1)  016622     000         $MFLG:  .BYTE   0               ;;MESSG. FLAG
(1)  016623     000         $LFLG:  .BYTE   0               ;;LOG FLAG
(1)  016624     000         $FFLG:  .BYTE   0               ;;FATAL FLAG
(1)          016626                 .EVEN
(1)          000200         APTSIZE=200
(1)          000001         APTENV=001
(1)          000100         APTSPOOL=100
(1)          000040         APTCSUP=040
```

```
                        .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

(1)  016626  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
(1)  016632  116637  000001  017051          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
(1)  016640  112637  017053                   MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
(1)  016644  062716  000002                   ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
(1)  016650  000406                           BR      $TYPON
(1)  016652  112737  000001  017051  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
(1)  016660  112737  000006  017053          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
(1)  016666  112737  000005  017050  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
(1)  016674  010346                           MOV     R3,-(SP)        ;;SAVE R3
(1)  016676  010446                           MOV     R4,-(SP)        ;;SAVE R4
(1)  016700  010546                           MOV     R5,-(SP)        ;;SAVE R5
(1)  016702  113704  017053                   MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
(1)  016706  005404                           NEG     R4
(1)  016710  062704  000006                   ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
(1)  016714  110437  017052                   MOVB    R4,$OMODE       ;;SAVE IT FOR USE
(1)  016720  113704  017051                   MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
(1)  016724  016605  000012                   MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
(1)  016730  005003                           CLR     R3              ;;CLEAR THE OUTPUT WORD
(1)  016732  006105                  1$:      ROL     R5              ;;ROTATE MSB INTO "C"
(1)  016734  000404                           BR      3$              ;;GO DO MSB
(1)  016736  006105                  2$:      ROL     R5              ;;FORM THIS DIGIT
(1)  016740  006105                           ROL     R5
(1)  016742  006105                           ROL     R5
(1)  016744  010503                           MOV     R5,R3
(1)  016746  006103                  3$:      ROL     R3              ;;GET LSB OF THIS DIGIT
(1)  016750  105337  017052                   DECB    $OMODE          ;;TYPE THIS DIGIT?
(1)  016754  100016                           BPL     7$              ;;BR IF NO
(1)  016756  042703  177770                   BIC     #177770,R3      ;;GET RID OF JUNK
(1)  016762  001002                           BNE     4$              ;;TEST FOR 0
(1)  016764  005704                           TST     R4              ;;SUPPRESS THIS 0?
(1)  016766  001403                           BEQ     5$              ;;BR IF YES
```

```
(1)  016770  005204                  4$:    INC    R4              ;;DON'T SUPPRESS ANYMORE 0'S
(1)  016772  052703  000060                 BIS    #'0,R3          ;;MAKE THIS DIGIT ASCII
(1)  016776  052703  000040           5$:   BIS    #' ,R3          ;;MAKE ASCII IF NOT ALREADY
(1)  017002  110337  017046                 MOVB   R3,8$           ;;SAVE FOR TYPING
(1)  017006  104401  017046                 TYPE   ,8$             ;;GO TYPE THIS DIGIT
(1)  017012  105337  017050           7$:   DECB   $OCNT           ;;COUNT BY 1
(1)  017016  003347                        BGT    2$              ;;BR IF MORE TO DO
(1)  017020  002402                        BLT    6$              ;;BR IF DONE
(1)  017022  005204                        INC    R4              ;;INSURE LAST DIGIT ISN'T A BLANK
(1)  017024  000744                        BR     2$              ;;GO DO THE LAST DIGIT
(1)  017026  012605                  6$:   MOV    (SP)+,R5        ;;RESTORE R5
(1)  017030  012604                        MOV    (SP)+,R4        ;;RESTORE R4
(1)  017032  012603                        MOV    (SP)+,R3        ;;RESTORE R3
(1)  017034  016666  000002  000004        MOV    2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
(1)  017042  012616                        MOV    (SP)+,(SP)
(1)  017044  000002                        RTI                    ;;RETURN
(1)  017046     000                 8$:    .BYTE  0               ;;STORAGE FOR ASCII DIGIT
(1)  017047     000                        .BYTE  0               ;;TERMINATOR FOR TYPE ROUTINE
(1)  017050     000                 $OCNT: .BYTE  0               ;;OCTAL DIGIT COUNTER
(1)  017051     000                 $OFILL:.BYTE  0               ;;ZERO FILL SWITCH
(1)  017052  000000                 $OMODE:.WORD  0               ;;NUMBER OF DIGITS TO TYPE
1475                                .SBTTL  BINARY TO ASCII AND TYPE ROUTINE
(1)
(2)                                 ;;**********************************************************************
(1)                                 ;*THIS ROUTINE IS USED TO CHANGE A 16-BIT BINARY NUMBER TO A 16-BIT
(1)                                 ;*BINARY-ASCII NUMBER AND TYPE IT.
(1)                                 ;*CALL:
(1)                                 ;*      MOV    NUMBER,-(SP)    ;;NUMBER TO BE TYPED
(1)                                 ;*      TYPBN                  ;;TYPE IT
(1)
(1)  017054  010146                 $TYPBN:MOV    R1,-(SP)        ;;SAVE R1 ON THE STACK
(1)  017056  016601  000006                MOV    6(SP),R1        ;;GET THE INPUT NUMBER
(1)  017062  000261                        SEC                    ;;SET "C" SO CAN KEEP TRACK OF THE NUMBER OF BITS
(1)  017064  112737  000060  017126  1$:   MOVB   #'0,$BIN         ;;SET CHARACTER TO AN ASCII "0".
(1)  017072  006101                        ROL    R1              ;;GET THIS BIT
(1)  017074  001406                        BEQ    2$              ;;DONE?
(1)  017076  105537  017126                ADCB   $BIN            ;;NO--SET THE CHARACTER EQUAL TO THIS BIT
(1)  017102  104401  017126                TYPE   ,$BIN           ;;GO TYPE THIS BIT
(1)  017106  000241                        CLC                    ;;CLEAR "C" SO CAN KEEP TRACK OF BITS
(1)  017110  000765                        BR     1$              ;;GO DO THE NEXT BIT
(1)  017112  012601                  2$:   MOV    (SP)+,R1        ;;POP THE STACK INTO R1
(1)  017114  016666  000002  000004        MOV    2(SP),4(SP)     ;;ADJUST THE STACK
(1)  017122  012616                        MOV    (SP)+,(SP)
(1)  017124  000002                        RTI                    ;;RETURN TO USER
(1)  017126     000     000         $BIN:  .BYTE  0,0             ;;STORAGE FOR ASCII CHAR. AND TERMINATOR
```

```
                                .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.

017130  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
017132  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
017136  005740                          TST     -(R0)           ;;BACKUP BY 2
017140  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
017142  006300                          ASL     R0              ;;POSITION FOR INDEXING
017144  016000  017164                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
017150  000200                          RTS     R0              ;;GO TO ROUTINE


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

017152  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
017154  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
017162  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
017164  017152                  $TRPAD: .WORD   $TRAP2
017166  016076                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
017170  016652                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
017172  016626                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
017174  016666                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
017176  017054                          $TYPBN  ;;CALL=TYPBN    TRAP+5(104405)  TYPE BINARY (ASCII) NUMBER


017200  014666                          $RDCHR  ;;CALL=RDCHR    TRAP+6(104406)  TTY TYPEIN CHARACTER ROUTINE
017202  015006                          $RDLIN  ;;CALL=RDLIN    TRAP+7(104407)  TTY TYPEIN STRING ROUTINE
017204  015160                          $RDOCT  ;;CALL=RDOCT    TRAP+10(104410) READ AN OCTAL NUMBER FROM TTY
017206  004136                          TEST    ;;CALL=CHECK    TRAP+11(104411)
017210  004130                          TESTIT  ;;CALL=CHKIT    TRAP+12(104412)
017212  011502                          DECTYP  ;;CALL=TYPDC    TRAP+13(104413)
                                .EVEN
017214  000310                  DIST:   .BLKW   200.            ;STATE-WIDTH DISTRIBUTION
020034  010000                  BUFFER: .BLKW   4096.           ;BUFFER AREA
        000001                  .END
```

```
ABASE = 170400              24#     38      77      78      79
ACDW1 = 000000              38
ACDW2 = 000000              38
ACPUOP= 000000              38
ADBUFF  001322              79#    312     322     358     374     384     395     421     447     461     514*    518*    550
                           552     553     555     734     789*    803*    805*    844*    870*    883     916*    922     928
                           991    1245
ADDW0 = 000000              38
ADDW1 = 000000              38
ADDW10= 000000              38
ADDW11= 000000              38
ADDW12= 000000              38
ADDW13= 000000              38
ADDW14= 000000              38
ADDW15= 000000              38
ADDW2 = 000000              38
ADDW3 = 000000              38
ADDW4 = 000000              38
ADDW5 = 000000              38
ADDW6 = 000000              38
ADDW7 = 000000              38
ADDW8 = 000000              38
ADDW9 = 000000              38
ADEVCT= 000000              38
ADEVM = 000000              38
ADST1   001320              78#    788*    802*    804*    918*
AENV  = 000000              38
AENVM = 000000              38
AFATAL= 000000              38
AGAIN   007504             974#   1011
AGATST  011674            1362#   1366
AGTST   011704             755*    771*    780*   1364#
AJGAIN  005544             673     690#
AJOFF   005472             671     677#
AMADR1= 000000              38
AMADR2= 000000              38
AMADR3= 000000              38
AMADR4= 000000              38
AMAMS1= 000000              38
AMAMS2= 000000              38
AMAMS3= 000000              38
AMAMS4= 000000              38
AMSG    012107             138    1373#
AMSGAD= 000000              38
AMSGLG= 000000              38
AMSGTY= 000000              38
AMTYP1= 000000              38
AMTYP2= 000000              38
AMTYP3= 000000              38
AMTYP4= 000000              38
APASS = 000000              38
APRIOR= 000200              26#     38      81
APTCSU= 000040            1471    1472#
APTENV= 000001            1468    1471    1472#
APTSIZ= 000200             164    1472#
APTSPO= 000100            1471    1472#
```

```
AROUND  007640            1010#
ASKCH   013743            1426#
ASWREG= 000000              38
ATESTN= 000000              38
ATMSG   012234             841    1383#
AUNIT = 000000              38
AUSWR = 000000              38
AVECT1= 100400              25#     38      80      82      83      84
AVECT2= 000000              38
BASEBR  001326              81#    808*    809*
BASECH  001342              87#    527     528     843     968    1233
BEGIN   001644              31     160#   1364
BEGINA  006122             212     759#
BEGINC  005420             215     663#
BEGINL  002670             270#    752     761
BEGINP  005674             218     715#
BEGINW  006204             224     775#
BEGIN2  001652              33     162#
BEGL    006064             199     221     750#
BEG2    002262              32     135     195#    689     712
BITPNT  001422             111#    912*    915     935     936*
BIT0  = 000001              22#    319     407     436     440     450     451     452
BIT00 = 000001              22#
BIT01 = 000002              22#
BIT02 = 000004              22#
BIT03 = 000010              22#
BIT04 = 000020              22#
BIT05 = 000040              22#
BIT06 = 000100              22#
BIT07 = 000200              22#
BIT08 = 000400              22#   1467
BIT09 = 001000              22#   1467    1468
BIT1  = 000002              22#
BIT10 = 002000              22#   1468
BIT11 = 004000              22#   1467
BIT12 = 010000              22#    277     314     323     324    1193
BIT13 = 020000              22#    723     735    1468
BIT14 = 040000              22#    281     425     427    1467
BIT15 = 100000              22#    329     344     355     425     427     439     449    1360
BIT2  = 000004              22#    300
BIT3  = 000010              22#    305     319
BIT4  = 000020              22#    296
BIT5  = 000040              22#    291
BIT6  = 000100              22#    286     407     411     729
BIT7  = 000200              22#    352     411     439
BIT8  = 000400              22#    273
BIT9  = 001000              22#    350     441
BPTVEC= 000014              22#
BUFFER  020034             951     996*    998*   1013    1041    1107    1119    1121    1141    1153    1154    1155    1177
                          1180    1483#
BUFF1   014064            1090    1434#
BUFF2   014112            1176    1435#
BUMPAD  006242             753     769     778     784#
BYPASS  006526             796     819#
B10     011432            1304#   1305
B11     011466            1314#   1315
```

```
CCHAN   012314            663    1389#
CH      012167            725    1379#
CHAN    012251           1220    1385#
CHANL   001372             99#    379*   390*   527*   571*   572    590*   591    593*   594    601*   665*   666
                          871     923   1221   1234*  1459
CHANNL  007446            967#
CHECK = 104411            347     356    366    375    444   1478#
CHKIT = 104412            274     282    287    292    297    301    306    330   1479#
CH1     001360             94#    599*   611    613    614*   840    842    860
CH2     001362             95#    600*   601    614    615*   836    856
CLEAR1  007374            953#    955
CLEAR2  007440            964#    966
CMSG    012114            132    1374#
COMPAR  011206            482     489    497    505    522    532    559    564    656   1255#
CONV    007036            881#    885
CONVR   007544            986     988#
CONVRT  011074            480     487    495    503    515    519    845   1232#
CR    = 000015             22#   1471
CRLF  = 000200             22#   1471
CRWR    012514            681     691    696   1395#
C0      014002            171    1427#
C2      014005           1099    1182   1428#
C3      014012           1179    1429#
DAC     001414            108#    578    581    584    587    627    631    701    705    859    863    913*   915*
                          916     935*
DASH    012143           1044    1377#
DDISP = 177570             22#     38    164
DECPNT  014620           1050*   1079*  1453#
DECTYP  011502           1321#   1480
DELAY   001416            109#    647*   651*   972*  1010*
DELAY1  007616            992    1003#
DELAY2  007624            994    1004   1005#
DELAY3  007542            987#
DELAY4  007336            799     942#   943
DELCLR  010704           1088    1100   1183   1193#
DF1     014664             55      62     68     74   1461#
DH1     014445             53    1449#
DH2     014501             72    1450#
DH3     014564             60      66   1451#
DIFLIN  007344            621     947#
DISPLA  001142             38#    164*   737*  1467*  1468*
DISPRE  000174             31#    164
DIST    017214            956    1024*  1091   1482#
DONE    012266           1283    1386#
DSWR  = 177570             22#     38    164
DT1     014624             54    1458#
DT2     014636             73    1459#
DT3     014654             61      67   1460#
DUMC    011326            413     420    429    432   1279#
DUMMY   001370             98#    528*   572*   666*   856*   860*   918
DUMW    011254            401     423   1269#
EDGE    001420            110#    624*   628*   698*   702*   878*   883*   886*   887*   888*   889*   893    928
EDGFLG  007142            588*    609*   895    901#
EMTVEC= 000030             22#    164*
EM1     014325             52    1444#
EM2     014347             59    1445#
```

```
EM3     014373            65    1446#
EM4     014420            71    1447#
ER      011066          1223    1225    1228#
ERMSG   012625           537     852    1056    1071    1083    1136    1228    1399#
ERR     006714           849     852#
ERRVEC= 000004            22#    164*     250     251*    266*    798*   1467*
FIRST   001352            91#    962*    1036    1038*
FIXADR  006340           785     797#
FIXONE  006344           188     798#
FLAG    001410           106#    166*    183*    1086  . 1139
GETDAT  010462          1144#   1152
GETEDG  006764           573     602     870#
GMSG    012121           146    1375#
GNS   = ****** U          31    1366    1477    1478    1479    1480
GUNITS  001436           117#    240*    255*    1366    1468*
HAFMSG  013015          1080    1405#
HALF    010146          1072    1074#
HEAD1   014145           186    1438#
HEAD5   013723           717    1424#
HT    = 000011            22#   1471
HUNS    014617          1330*   1342*   1344*   1347    1452#
IGND    012455           677    1394#
INRNGE  007704          1020    1023#
IOTVEC= 000020            22#    164*
ISERV   001464           127#    190
IVOLT   012543           690    1396#
KBVECT  001344            88#    189     821
LAST    010020          1034    1048#
LEND    005212           620     622#
LESS    011420          1299    1301#
LF    = 000012            22#   1471
LINEA   013702          1129    1423#
LOAD    010662          1178    1181    1185#
LOADY   011400          1094    1096    1188    1295#
LOADO   010666          1186#   1190
LO2     010660          1140    1184#
LSB     012177           835    1381#
LSBMSG  012134          1046    1376#
MAT     014035           837    1432#
MAX     001430           114#   1160*   1165    1167*   1171
MAXTST  010560          1163    1165#
MEND    013115           762    1408#
MESP    013077          1218    1407#
MESR    013064          1215    1406#
METST   014042          1273    1433#
MIN     001424           112#   1159*   1162    1164*   1170
MINUS   012103           898    1323    1371#
MLSB    014027           639    1431#
MOFSET  014014           530    1430#
MSG16   013272          1089    1417#
MSG18   013200          1175    1411#
MSG20   013240           947    1415#
MSG21   013655          1106    1422#
MSG50   013157           263    1410#
MSG71   013617           202    1421#
MOLSB   012431           695    1393#
```

```
NAR     010064          1057    1059#
NARMSG  012664          1061    1401#
NARROW  001350            90#    961*   1028*   1059    1074
NBEXT   001364            96#    252*    254*    262     264*    265     784     795*    817*
NEXT    007510           975#   1009
NMBEXT  001366            97#    265*    817
NOI     012241          1206    1384#
NOIMSG  012042           570    1369#
NONE    001636           143     145     156#
NOTNAR  007740          1027    1033#
NOTNEW  010354          1116    1121#
NOTOK   007610          1001#   1007
NOVT55  002212           174     177     182     186#    234
NXTCMP  010544          1161#   1169
NXTCVT  007224           918#    932
NXTSTA  010316          1108#   1122
NXTY1   010252          1093#   1098
NXTB    010526          1157#   1174
OFFERR  004520           535     537#
OFFOK   004526           536     539#
OFFSET  005214           529     624#    683
OKAY    007634           997     999    1002    1008#
OKAYD   011526          1326    1328#
OKMSG   012303           539     850    1058    1073    1085    1138    1226    1388#
ONAD    013141          1275    1409#
ONES    014622          1328*   1334*   1335    1337*   1346*   1455#
OUT     001434           116#    959*   1021*   1063    1066    1069    1076
OUTMSG  012762          1068    1403#
PEAK    001406           105#    575*    584*    587*   1210    1212*   1216    1224
PERCNT  001432           115#    907*    908*    909*    910*    911*    933
PIRQ  = 177772            22#
PIRQVE= 000240            22#
PLUS    010336          1113    1115#
PLUSR2  011406          1296    1298#
POPRO   001616           151#    157
POS     011514          1322    1325#
POSITV  012623           637    1398#
POSPEA  010774          1211    1213#
POSRMS  010762          1208    1210#
PR0   = 000000            22#
PR1   = 000040            22#
PR2   = 000100            22#
PR3   = 000140            22#
PR4   = 000200            22#
PR5   = 000240            22#
PR6   = 000300            22#
PR7   = 000340            22#
PS    = 177776            22#
PSW   = 177776            22#
PWRVEC= 000024            22#
QUEST   012105           156     225    1372#
RBEG    001660           161     163#
RDCHR = 104406          1463    1477#
RDLIN = 104407           203     668     678     692    1465    1477#
RDOCT = 104410           149     664    1477#
READ    007656          1014#   1049
```

```
RELACC  010302  1087  1104#
REST1   002216   168   187#
RESVEC= 000010    22#   799*
RET     007140   896   900#
RETERR  004160   471   473#
RETURN  001620   152#   727   880   919  1241
RET1    001630   154#   973
RET2    001634   153   155#
RMS     001404   104#   574*  578*  581*  1207  1209*  1213  1222
RNA     001376   101#   192*  948
RNB     001400   102#   193*  949
RNC     001402   103#   194*  950
RST     011356   134   140  1287#
SARSUB  007144   576   579   582   585   625   629   699   703   857   861   907#
SAR1    007170   912#
SEL     012342   667  1390#
SETCH   012212   839  1382#
SETMSG  012061   598  1370#
SET1A   006722   604   605   856#
SHIFT   007326   934   936#
SKIPST  001354    92#   963*  1031*  1051  1054
SKPMSG  012642  1053  1400#
SLASH   012301   148  1131  1387#
SPACE   012172   646   739  1380#
SPREAD  001412   107#   380*  391*  1256*  1263  1459
STACK = 001100    22#   133   139   164   195
STATE   012147  1039  1378#
STKLMT= 177774    22#
STREG   001316    77#   309*  310   319*  320   334*  337   344*  351*  355*  362*  363   371*
                 372   381*  382   392*  393   407*  408   410   425*  426   433*  436*  437
                 440*  450*  451*  452*  453   459   462*  468*  469   545*  547*  548   716*
                 730*  732*  763   787*  801*  874*  881*  920*  926*  971*  988*  1237*  1243*
                1276  1458  1459  1460
SWDIST  010220  1084  1086#
SWR     001140    38#   144   147   150*  164*  721   723   735  1193  1467  1468
SWREG   000176    31#   164
SW0   = 000001    22#
SW00  = 000001    22#
SW01  = 000002    22#
SW02  = 000004    22#
SW03  = 000010    22#
SW04  = 000020    22#
SW05  = 000040    22#
SW06  = 000100    22#
SW07  = 000200    22#
SW08  = 000400    22#
SW09  = 001000    22#
SW1   = 000002    22#
SW10  = 002000    22#
SW11  = 004000    22#
SW12  = 010000    22#
SW13  = 020000    22#
SW14  = 040000    22#
SW15  = 100000    22#
SW2   = 000004    22#
SW3   = 000010    22#
```

```
SW4    = 000020            22#
SW5    = 000040            22#
SW6    = 000100            22#
SW7    = 000200            22#
SW8    = 000400            22#
SW9    = 001000            22#
TADDR    001374           100#    141     715*    750*    759*    775*
TBITVE= 000014            22#
TCHK     005312           641#    685     708
TEMP     001356            93#    242*    245*    248*    257*    517     521*    558*    563*    627*    631*    632*    635
                          701*    705*    706*    847    1001*   1006*   1236*   1245*   1248*   1249*   1250*   1251*   1257
TENS     014621          1329*   1338*   1339    1341*   1345*   1454#
TEST     004136           469#   1478
TESTAD   002464           239#    751     760     776
TESTIT   004130           468#   1479
TESTR2   011542          1331#   1336    1340    1343
TKVEC =  000060            22#
TOFF     005270           531     635#    684     707
TPVEC =  000064            22#
TRAPVE=  000034            22#    164*
TRTVEC=  000014            22#
TRY      007202           914#    937
TRYAG    002314           203#    226
TSTBIT   001440           118#    241*    255     256*    267*    786*    800*   1468
TST1     002670           271#    272
TST10    003050           308#
TST11    003112           315     318#
TST12    003156           325     328#
TST13    003172           332#
TST14    003236           338     342#
TST15    003270           349#
TST16    003332           360#
TST17    003374           370#
TST2     002732           280#
TST20    003420           377#    430
TST21    003464           385     388#
TST22    003542           397     400#
TST23    003670           414     422#
TST24    003754           435#
TST25    004026           448#
TST26    004162           477#    478     479
TST27    004232           486#
TST3     002746           284#
TST30    004262           494#
TST31    004312           501#
TST32    004364           513#
TST33    004444           526#
TST34    004532           538     541#
TST35    004660           569#
TST36    005044           597#
TST37    005170           612     618#
TST4     002770           290#
TST5     003004           295#
TST6     003020           299#
TST7     003034           304#
TST8     010572          1166    1168#
```

```
TYPBAD  007752          1022  1032  1036#
TYPBN = 104405          1366  1477#
TYPDC = 104413           638   834  1045  1052  1060  1064  1067  1078  1128  1214  1217  1480#
TYPE  = 104401           132   138   146   148   156   171   186   202   225   263   530   537   539
                         570   598   637   639   644   646   663   667   674   677   680   681   690
                         691   694   695   696   717   725   739   746   762   767   835   837   839
                         841   850   852   898   947  1039  1044  1046  1053  1056  1058  1061  1065
                        1068  1071  1073  1080  1083  1085  1089  1090  1099  1106  1129  1131  1136
                        1138  1175  1176  1179  1182  1203  1206  1215  1218  1220  1226  1228  1273
                        1275  1283  1323  1347  1366  1463  1468  1469  1471  1474  1475  1477#
TYPEDG  007100           838   893#  1219
TYPOC = 104402          1469  1477#
TYPON = 104404          1477#
TYPOS = 104403           147   262   726   740   764   836   840   847   894   899  1043  1130  1133
                        1221  1274  1276  1477#
TYPOUT  011616          1332  1344#
TYPRP   010744           589  1206#
TYPSET  006572           610   834#
UNEXP   001442           120#  285   416
VADR    001336            85#  259   787   788   789
VECTOR  001324            80#  285*  405*  416*  727*  790*  806*  807*  810   812   814   880*  919*
                         973*  1241*
VECTR1  001330            82#  406*  791*  794*  810*  811*  816*
VECTR2  001332            83#  424*  792*  812*  813*
VECTR3  001334            84#  793*  814*  815*
VLIN    011670          1134  1359#
VNP     011664          1224  1357#
VNR     011662          1222  1356#
VSET    011666           848  1358#
VTFLG   002432           172   175   178   228#
VTINIT  014132          1203  1436#
VT55    002206           180   183#
VVCT    001340            86#  790   791   792   793
V0      011646           561   566  1349#
V12     011654           484   507  1352#
V2      011650           524  1350#
V326    011660           491   499  1354#
V4      011652           658  1351#
V50D    011656           534  1353#
WFTEST  001426           113#  160*  162*  200   246
WIDE    001346            89#  960*  1035*  1062  1075
WIDMSG  012723          1065  1402#
WRAP    004162           476#  768   777
XADJ    012415           680  1392#
YADJ    012607           694  1397#
$APTHD  001000            37#
$ASTAT= ****** U        1472
$ATYC   016404          1472#
$ATY1   016360          1472#
$ATY3   016366          1471  1472#
$ATY4   016376          1468  1472#
$AUTOB  001134            38#
$BASE   001250            38#  249   801   802   803
$BDADR  001122            38#
$BDDAT  001126            38#  249*  253   259*  312*  314   322*  324   337*  384*  395*  396   410*
                         426*  453*  454*  455   469*  470  1257*  1258  1458  1459  1460
```

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$BELL   001164            38#   1468
$BIN    017126          1475#*
$CDW1   001254            38#
$CHARC  016354          1471#*
$CKSWR= ****** U        1477
$CMTAG  001100            38#    164
$CM3  = 000000            38#
$CNTLG  015131          1463#
$CNTLU  015124          1463#
$CPUOP  001222            38#
$CRLF   001171            38#    644    746    767   1463   1468   1469   1471
$DEVCT  001204            38#
$DEVM   001252            38#
$DOAGN  012032          1366#
$ENDAD  012022            35   1366#   1468
$ENDCT  011742           164   1366#
$ENULL  012036          1366#
$ENV    001214            38#   1468   1471   1472
$ENVM   001215            38#    164    243   1471   1472
$EOP    011706           756    772    781   1366#
$EOPCT  011734           164*  1366#
$ERFLG  001103            38#    121*  1467*  1468*
$ERMAX  001115            38#    164*  1467*
$ERROR  015540           164   1468#
$ERRPC  001116            38#   1458   1459   1460   1468*  1469
$ERRTB  001256            38#   1469
$ERRTY  015742          1468    1469#
$ERTTL  001112            38#   1468*
$ESCAP  001162            38#    120*   123*   164*  1467*  1468
$ETABL  001214            38#
$ETEND  001256            37     38#
$FATAL  001176            38#   1472*
$FFLG   016624          1472#*
$FILLC  001156            38#   1471
$FILLS  001155            38#   1471
$GDADR  001120            38#
$GDDAT  001124            38#    273*   276*   277    281*   286*   291*   296*   300*   305*   313*   323*   329*
                        333*    352*   361*   378*   389*   396    411*   427*   439*   449*   455    468    470
                       1255*   1259   1458   1459
$GET42  012012          1366#
$GTSWR= ****** U        1477
$HD   = 000000            21
$HIBTS  001000            37#
$HIOCT  015260          1465#*
$ICNT   001104            38#   1467*
$INTAG  001135            38#
$ITEMB  001114            38#   1468*  1469
$LF     001172            38#   1463   1468   1471
$LFLG   016623          1472#*
$LPADR  001106            38#    164*   271*   479*  1272*  1282*  1467*
$LPERR  001110            38#    164*   272*   478*  1271*  1281*  1467*  1468
$MADR1  001226            38#
$MADR2  001232            38#
$MADR3  001236            38#
$MADR4  001242            38#
$MAIL   001174            37     38#    164   1467   1468   1471
```

```
$MAMS1  001224            38#
$MAMS2  001230            38#
$MAMS3  001234            38#
$MAMS4  001240            38#
$MBADR  001002            37#
$MFLG   016622          1472#*
$MNEW   015147          1463#
$MSGAD  001210            38#   1472*
$MSGLG  001212            38#   1472*
$MSGTY  001174            38#   1472*
$MSWR   015136          1463#
$MTYP1  001225            38#
$MTYP2  001231            38#
$MTYP3  001235            38#
$MTYP4  001241            38#
$MXCNT  015536          1467#
$NULL   001154            38#   1471
$NWTST= 000001           271#    280#    284#    290#    295#    299#    304#    308#    318#    328#    332#    342#    349#
                         360#    370#    377#    388#    400#    422#    435#    448#    477#    486#    494#    501#    513#
                         526#    541#    569#    597#    618#
$OCNT   017050          1474#*
$OMODE  017052          1474#*
$OVER   015522          1467#
$PASS   001202            38#    164*    239*    619    1269    1279    1366*   1467
$PASTM  001006            37#
$QUES   001170            38#    674    1463    1468    1471
$RDCHR  014666          1463#   1477
$RDDEC= ****** U        1477
$RDLIN  015006          1463#   1477
$RDOCT  015160          1465#   1477
$RDSZ = 000010          1463#
$RTNAD  012034          1366#
$R2A  = ****** U        1477
$SAVRE= ****** U        1477
$SCOPE  015262           164   1467#
$SETUP= 000027            39#    164    1366    1463    1467    1468
$STUP = 177777            39#
$SVLAD  015466          1467#
$SVPC = 000214            35#
$SWR  = 167400             6#     21     23     38    164    271    280    284    290    295    299    304    308
                         318    328    332    342    349    360    370    377    388    400    422    435    448
                         477    486    494    501    513    526    541    569    597    618   1366   1467   1468
$SWREG  001216            38#    164
$SWRMK= 000000            23    1467
$TESTN  001200            38#   1467*
$TIMES  001160            38#    164*    332*    343*    360*    477*    486*    494*    501*    513*    526*    542*    569*
                         597*    618*   1366*   1467*
$TKB    001146            38#    128    235    654   1463
$TKS    001144            38#    170*    204*    229    336*    346*    368*    648*    649    655*   1288*   1362*   1463
$TN   = 000040             7#     21    271#    280#    284#    290#    295#    299#    304#    308#    315    318#    325
                         328#    332#    338    342#    349#    360#    370#    377#    385    388#    397    400#    401
                         414    422#    423    435#    448#    477#    486#    494#    501#    513#    526#    538    541#
                         569#    597#    612    618#
$TPB    001152            38#   1306*   1316*   1471*
$TPFLG  001157            38#   1471
$TPS    001150            38#   1304    1314    1471
```

```
$TRAP   017130            164    1477#
$TRAP2  017152           1477#
$TRP  = 000014           1477#   1478#   1479#   1480#
$TRPAD  017164           1477#
$TSTM   001004             37#
$TSTNM  001102             38#    477*   1366*   1467*   1468
$TTYIN  015114           1463#
$TYPBN  017054           1475#   1477
$TYPDS= ****** U         1477
$TYPE   016076           1471#   1472    1477
$TYPEC  016310           1471#
$TYPEX  016356           1471#
$TYPOC  016652           1474#   1477
$TYPON  016666           1474#   1477
$TYPOS  016626           1474#   1477
$UNIT   001206             38#
$UNITM  001010             37#
$USWR   001220             38#
$VECT1  001244             38#    806     808
$VECT2  001246             38#
$XTSTR  015272           1467#
$$GET4= 000000           1366#
$OFILL  017051           1474#*
$40CAT= ****** U         1467    1468
.     = 040034             28#     31#     35#     36#     37#     38#    164    1366#   1463#   1467    1468    1469#   1471
                         1472#   1482#   1483#
.$ASTA= ****** U         1472
.$X   = 001000             37#
```

```
BERROR      17#   1468
COMMEN      22#
DUMWRN      43#    401    423
ENDCOM      22#
ENDPAS      12#   1366
ERROR       22#    122    275    283    288    293    298    302    307    316    326    331    339    348    357
           367    376    386    398    412    428    445    457    485    492    500    508    525    562    567
ESCAPE      22#    120
GETPRI      22#
GETSWR      22#
MULT        22#
NEWTST      22#    271    280    284    290    295    299    304    308    318    328    332    342    349    360
           370    377    388    400    422    435    448    477    486    494    501    513    526    541    569
           597    618
POP         22#   1465   1472
PUSH        22#   1465   1472
REPORT      22#
SCOPE       22#    280    284    290    295    299    304    308    318    328    332    342    349    360    370
           377    388    400    422    435    448    463    486    494    501    513    526    541    569    597
           618
SETPRI      22#
SETTRA    1477#   1478   1479   1480
SETUP       22#    164
SKIP        22#    201    211    214    217    220    223    230    232    234    244    247    258    260    278
           311    315    321    325    338    385    397    414    456    471    511    538    592    595    612
           616    636    642    645    650    652    653    659    671    673    675    686    687    709    710
           724   1194   1196
SLASH       22#
SPACE       22#
STARS       22#     35     37     38    271    280    284    290    295    299    304    308    318    328    332
           342    349    360    370    377    388    400    422    435    448    477    486    494    501    513
           526    541    569    597    618   1366   1463   1465   1467   1468   1469   1471   1472   1474   1475
          1477
SWRSU       22#   164#
TRMTRP    1477#
TYPBIN      22#   1366
TYPDEC      22#
TYPNAM      22#
TYPNUM      22#
TYPOCS      22#    147    262    726    740    836    840    847    894    899   1043   1130   1133   1221   1274
          1276
TYPOCT      22#   1469
TYPTXT      22#   1366
$$CMRE      38#
$$CMTM      38#
$$ESCA      22#
$$NEWT      22#    271    280    284    290    295    299    304    308    318    328    332    342    349    360
           370    377    388    400    422    435    448    477    486    494    501    513    526    541    569
           597    618
$$SET     1477#   1478   1479   1480
$$SETM     164#
$$SKIP      22#    315    325    338    385    397    414    558    612
.EQUAT       8#     22
.HEADE       8#     21
.SETUP      10#     39
.SWRHI      10#     23
```

```
.SWRLO     23#
.$ACT1     11#     35
.$APTB     11#     38#
.$APTH     11#     37
.$APTY     11#   1472
.$CATC      8#     31
.$CMTA      8#     38
.$EOP       8#   1366
.$ERRO      8#   1468
.$ERRT     10#   1469
.$PARM      9#
.$POWE      9#
.$RAND     11#
.$RDOC     11#   1465
.$READ      9#   1463
.$SAVE      9#
.$SCOP      9#   1467
.$SPAC     10#
.$SWDO     10#
.$TRAP     10#   1477
.$TYPB      9#   1475
.$TYPD     11#
.$TYPE     10#   1471
.$TYPO      9#   1474


. ABS.  040034     000     OVR   RO    ABS   LCL   I

 ERRORS DETECTED:  0

 CVADAC,CVADAC/CRF=CVADAC
 RUN-TIME: 20 9 1 SECONDS
 RUN-TIME RATIO: 99/31=3.1
 CORE USED:  26K  (51 PAGES)
```