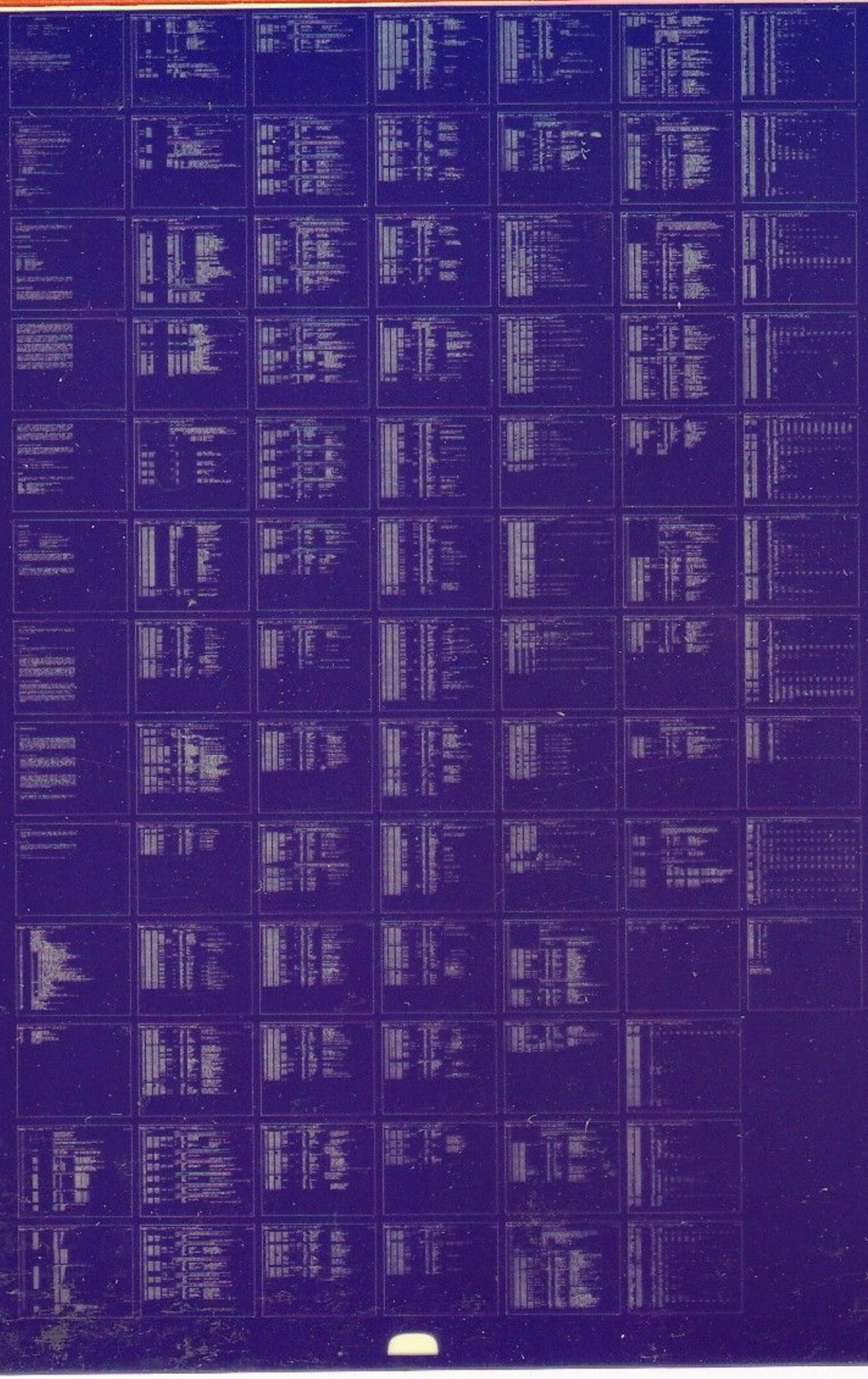
ADV11-A

PERFORMANCE TEST
CVADAB0

AH-8175B-MC

FICHE 1 OF 1

DEC 1978
digital
MADE IN USA



IDENTIFICATION

Product Code: AC-8174B-MC

Product Name: CVADAB0 - ADV11 Performance Test

Date: July 1978

Maintainer: Diagnostic Group

1.0 ABSTRACT

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 BERG 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 BERG 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 BERG test connector)

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

2.0 REQUIREMENTS

2.1 Equipment

LSI-11 computer with 8K of memory
I/O Terminal
ADV11 Module
VT55 Terminal supported for graphic output
BERG test connector

2.2 Storage

This program uses all 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 display
SW11=1 Inhibit iterations
SW10=1 Bell on error
SW9 =1 Loop on error
SW8 =1 Loop on test in SWR <7:0>

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 BERG 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) (1332) and VVCT (vector address) (1334). 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 BERG 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 23 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.

```
 20                                .TITLE  MAINDEC-11-DVADA-B
(1)                                ;*COPYRIGHT (C) 1978
(1)                                ;*DIGITAL EQUIPMENT CORP.
(1)                                ;*MAYNARD, MASS. 01754
(1)                                ;*
(1)                                ;*PROGRAM BY GEORGE STEVENS
(1)                                ;*
(1)                                ;*THIS PROGRAM WAS ASSEMBLED USING THE PDP-11 MAINDEC SYSMAC
(1)                                ;*PACKAGE (MAINDEC-11-DZQAC-C3), JAN 19, 1977.
(1)                                ;*
 21                                .SBTTL  BASIC DEFINITIONS
(1)
(1)                                ;*INITIAL ADDRESS OF THE STACK POINTER *** 1100 ***
(1)          001100                STACK=  1100
(1)                                .EQUIV  EMT,ERROR       ;;BASIC DEFINITION OF ERROR CALL
(1)                                .EQUIV  IOT,SCOPE       ;;BASIC DEFINITION OF SCOPE CALL
(1)
(1)                                ;*MISCELLANEOUS DEFINITIONS
(1)          000011                HT=     11              ;;CODE FOR HORIZONTAL TAB
(1)          000012                LF=     12              ;;CODE FOR LINE FEED
(1)          000015                CR=     15              ;;CODE FOR CARRIAGE RETURN
(1)          000200                CRLF=   200             ;;CODE FOR CARRIAGE RETURN-LINE FEED
(1)          177776                PS=     177776          ;;PROCESSOR STATUS WORD
(1)                                .EQUIV  PS,PSW
(1)          177774                STKLMT= 177774          ;;STACK LIMIT REGISTER
(1)          177772                PIRQ=   177772          ;;PROGRAM INTERRUPT REQUEST REGISTER
(1)          177570                DSWR=   177570          ;;HARDWARE SWITCH REGISTER
(1)          177570                DDISP=  177570          ;;HARDWARE DISPLAY REGISTER
(1)
(1)                                ;*GENERAL PURPOSE REGISTER DEFINITIONS
(1)          000000                R0=     %0              ;;GENERAL REGISTER
(1)          000001                R1=     %1              ;;GENERAL REGISTER
(1)          000002                R2=     %2              ;;GENERAL REGISTER
(1)          000003                R3=     %3              ;;GENERAL REGISTER
(1)          000004                R4=     %4              ;;GENERAL REGISTER
(1)          000005                R5=     %5              ;;GENERAL REGISTER
(1)          000006                R6=     %6              ;;GENERAL REGISTER
(1)          000007                R7=     %7              ;;GENERAL REGISTER
(1)          000006                SP=     %6              ;;STACK POINTER
(1)          000007                PC=     %7              ;;PROGRAM COUNTER
(1)
(1)                                ;*PRIORITY LEVEL DEFINITIONS
(1)          000000                PR0=    0               ;;PRIORITY LEVEL 0
(1)          000040                PR1=    40              ;;PRIORITY LEVEL 1
(1)          000100                PR2=    100             ;;PRIORITY LEVEL 2
(1)          000140                PR3=    140             ;;PRIORITY LEVEL 3
(1)          000200                PR4=    200             ;;PRIORITY LEVEL 4
(1)          000240                PR5=    240             ;;PRIORITY LEVEL 5
(1)          000300                PR6=    300             ;;PRIORITY LEVEL 6
(1)          000340                PR7=    340             ;;PRIORITY LEVEL 7
(1)
(1)                                ;*''SWITCH REGISTER'' SWITCH DEFINITIONS
(1)          100000                SW15=   100000
(1)          040000                SW14=   40000
(1)          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
 22                                     .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>
 23             170400                  ABASE=  170400
 24             100400                  AVECT1= 100400
 25             000200                  APRIOR= 200
 26
 27             000100                          .=100
 28  000100     000104  000200  000002          .WORD   104,200,2
 29
 30                                     .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     @#BEGIN ;;JUMP TO STARTING ADDRESS OF PROGRAM
 31  000204     000137  002262                  JMP     @#BEG2          ;RESTART ADDRESS
 32  000210     000137  001652                  JMP     @#BEGIN2                ;START ADDRESS FOR OPTION TEST AREA
```

```
                                .SBTTL  ACT11 HOOKS

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

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

                                $APTHD:
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                         $ERRTB:
 39
 40
 41
 50                                 ;ITEM   1
 51  001256  014267                         EM1                     ;STATUS REG. ERROR
 52  001260  014407                         DH1                     ;ERRPC STREG EXPECTED ACTUAL
 53  001262  014566                         DT1                     ;$ERRPC, STREG, $GDDAT, $BDDAT
 54  001264  014626                         DF1
 55
 56
 57                                 ;ITEM   2
 58  001266  014311                         EM2                     ;FAILED TO INTERRUPT
 59  001270  014526                         DH3                     ;ERRPC STREG ACTUAL
 60  001272  014616                         DT3                     ;$ERRPC, STREG,  $BDDAT
 61  001274  014626                         DF1
 62
 63                                 ;ITEM   3
 64  001276  014335                         EM3                     ;UNEXPECTED INTERRUPT
 65  001300  014526                         DH3                     ;ERRPC STREG
 66  001302  014616                         DT3                     ;$ERRPC, STREG
 67  001304  014626                         DF1
 68
 69                                 ;ITEM   4
 70  001306  014362                         EM4                     ;ERROR ON A/D CHANNEL
 71  001310  014443                         DH2                     ;ERRPC  STREG  CHAN  NOMINAL  TOL  ACTUAL
 72  001312  014600                         DT2                     ;$ERRPC,STREG,CHANL,$GDDAT,SPREAD,$BDDAT
 73  001314  014626                         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  012056                  TYPE    ,CMSG           ;ECHO CHARACTER
001510  012706  001100                  MOV     #STACK,SP
001514  004737  011320                  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  012051                  TYPE    ,AMSG           ;ECHO CHARACTER
001536  012706  001100                  MOV     #STACK,SP
001542  004737  011320                  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  012063                  TYPE    ,GMSG           ;ECHO CHARACTER
001574  017746  177340                  MOV     @SWR,-(SP)      ;;SAVE @SWR FOR TYPEOUT
(1)                                     TYPOS                   ;;TYPE SWREG
(1)     001600  104403                  .BYTE   6               ;;GO TYPE--OCTAL ASCII
(1)     001602     006                  .BYTE   1               ;;TYPE 6 DIGITS
(1)     001603     001                                          ;;TYPE LEADING ZEROS
001604  104401  012243                  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  012047          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  015224  000020  MOV     #$SCOPE,@#IOTVEC ;;IOT VECTOR FOR SCOPE ROUTINE
(1)     001710  012737  000340  000022  MOV     #340,@#IOTVEC+2 ;;LEVEL 7
(1)     001716  012737  015502  000030  MOV     #$ERROR,@#EMTVEC ;;EMT VECTOR FOR ERROR ROUTINE
(1)     001724  012737  000340  000032  MOV     #340,@#EMTVEC+2 ;;LEVEL 7
(1)     001732  012737  017072  000034  MOV     #$TRAP,@#TRAPVEC ;;TRAP VECTOR FOR TRAP CALLS
(1)     001740  012737  000340  000036  MOV     #340,@#TRAPVEC+2;LEVEL 7
(1)     001746  013737  011704  011676  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     #$SWREG,SWR     ;;NO,USE APT SWITCH REGISTER
(2)     002116                  67$:
```

```
                                        CLR     FLAG            ;CLEAR VT55 FLAG
                                        TST     @#42                    ;IS IT CHAINED?
                                        BNE     REST1
                                .SBTTL          DETERMINE IF VT55 TYPE TERMINAL IS PRESENT
                                        BIC     #100,@$TKS
                                        TYPE    ,C0             ;TYPE ASCIZ STRING
                                        JSR     PC,VTFLG        ;GET A CHARACTER
                                        CMP     R0,#33
                                        BNE     NOVT55          ;NO VT55 PRESENT
                                        JSR     PC,VTFLG        ;GET A CHARACTER
                                        CMP     R0,#57
                                        BNE     NOVT55          ;NO VT55 PRESENT
                                        JSR     PC,VTFLG        ;GET A CHARACTER
                                        CMP     R0,#103
                                        BEQ     VT55            ;VT55 IS PRESENT
                                        CMP     R0,#105
                                        BNE     NOVT55
                                VT55:   INC     FLAG
```

```
                                        .SBTTL      DIALOGUE TO DETERMINE WHICH TEST TO RUN
002212  104401  014107          NOVT55: TYPE    ,HEAD1
002216  000005                  REST1:  RESET
002220  004737  006310                  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  006030          2$:     JMP     BEGL                    ;GO TO LOGIC TESTS
002302  005737  001426                  TST     WFTEST                  ;TEST FOR OPTION TEST
002306  001373                          BNE     2$              ;;
002310  104401  013561          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  006066                  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  005364                  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  005640                  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  006030                  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  006150                  JMP     BEGINW                  ;GO TO WRAPAROUND TEST
002424  104401  012047          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,$GDDAT
002742  104412                         CHKIT
002744  104001                         ERROR   1                       ;FAILED TO LOAD + READ ERROR I.E.
                                ;;**************************************************************
                                ;*TEST 3         LOAD AND READ BACK INTERRUPT ENABLE BIT6
                                ;;**************************************************************
002746  000004                 TST3:   SCOPE
002750  012737  001442  176346         MOV     #UNEXP,@VECTOR          ;SETUP FOR UNEXPECTED INTERUPT
002756  012737  000100  001124         MOV     #BIT6,$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
                        ;;*************************************************************************
003034  000004  TST7:   SCOPE
003036  012737  000010  001124          MOV     #BIT3,$GDDAT
003044  104412                        CHKIT
003046  104001                        ERROR   1                       ;FAILED TO LOAD + READ ENABLE I.D. BIT
                        ;;*************************************************************************
                        ;*TEST 10        TEST I.D. BIT (BIT 12) CLEARED
                        ;;*************************************************************************
003050  000004  TST10:  SCOPE
003052  012777  000001  176236          MOV     #1,@STREG       ;CLEAR I.D. ENABLE
003060  105777  176232  1$:     TSTB    @STREG                  ;WAIT FOR CONVERSION
003064  100375                        BPL     1$                      ;;CONVERSION IS NOT DONE YET
003066  032777  010000  176226          BIT     #BIT12,@ADBUFF  ;IS I.D. BIT CLEARED?
003074  001401                        BEQ     TST11                   ;;YES - GOTO NEXT TEST
003076  104001                        ERROR   1
                        ;;*************************************************************************
                        ;*TEST 11        TEST I.D. BIT (BIT 12) SET
                        ;;*************************************************************************
003100  000004  TST11:  SCOPE
003102  012777  000011  176206          MOV     #BIT3!BIT0,@STREG       ;SET I.D. ENABLE BIT
003110  105777  176202  1$:     TSTB    @STREG                  ;WAIT FOR CONVERSION
003114  100375                        BPL     1$                      ;;CONVERSION IS NOT DONE YET
003116  032777  010000  176176          BIT     #BIT12,@ADBUFF  ;IS I.D. BIT SET?
003124  001001                        BNE     TST12                   ;;YES - GOTO NEXT TEST
003126  104001                        ERROR   1
                        ;;*************************************************************************
                        ;*TEST 12        LOAD AND READ BACK ERROR FLAG BIT15
                        ;;*************************************************************************
003130  000004  TST12:  SCOPE
003132  012737  100000  001124          MOV     #BIT15,$GDDAT   ;LOAD EXPECTED DATA
003140  104412                        CHKIT
003142  104001                        ERROR   1                       ;FAILED TO LOAD + READ ERROR FLAG
                        ;;*************************************************************************
                        ;*TEST 13        TEST INIT CLEARS BITS 2-6,8-11,14
                        ;;*************************************************************************
003144  000004  TST13:  SCOPE
003146  012737  000300  001160          MOV     #300,$TIMES     ;;DO 300 ITERATIONS
003154  005037  001124                  CLR     $GDDAT          ;LOAD EXPECTED DATA
003160  012777  047574  176130  2$:     MOV     #47574,@STREG   ;SET STATUS REGISTER
003166  000005                        RESET                   ;INITIALIZE
003170  052777  000100  175746          BIS     #100,@$TKS      ;SET INTRPT. ENABLE
003176  017737  176114  001126          MOV     @STREG,$BDDAT   ;READ STATUS REGISTER
003204  001401                        BEQ     TST14           ;;NEXT TEST
003206  104001                        ERROR   1               ;RESET FAILED TO CLEAR AD ST. REG. BITS
```

```
                                ;;*****************************************************************
                                ;*TEST 14        TEST INIT CLEARS ERROR FLAG
                                ;;*****************************************************************
                                ;
003210  000004                  TST14:  SCOPE
003212  012737  000300  001160          MOV     #300,$TIMES             ;DO 300 ITERATIONS
003220  012777  100000  176070          MOV     #BIT15,@STREG           ;SET BIT 15
003226  000005                          RESET                           ;ISSUE INIT
003230  052777  000100  175706          BIS     #100,@$TKS                      ;SET INTRPT. EN. FOR KEYBOARD
003236  104411                          CHECK
003240  104001                          ERROR   1
                                ;;*****************************************************************
                                ;*TEST 15        TEST  DONE FLAG  SETS AND BIT0 CLEARS ON END OF CONV.
                                ;;*****************************************************************
                                ;
003242  000004                  TST15:  SCOPE
003244  012700  001000                  MOV     #BIT9,R0        ;STALL TIME COUNTER
003250  005277  176042                  INC     @STREG          ;START CONVERSION
003254  012737  000200  001124          MOV     #BIT7,$GDDAT    ;LOAD EXPECTED
003262  005300                  1$:     DEC     R0              ;STALL
003264  001376                          BNE     1$              ;TIME
003266  042777  100000  176022          BIC     #BIT15,@STREG   ;MASK OUT ERROR BIT
003274  104411                          CHECK
003276  104001                          ERROR   1               ;A/D DONE FLAG FAILED TO SET;BIT0 FAILED TO CLEAR
003300  017700  176016                  MOV     @ADBUFF,R0      ;CLEAR DONE FLAG FOR ITERATIONS
```

```
                                ;;*****************************************************************
                                ;*TEST 16        TEST INIT CLEARS DONE FLAG
                                ;;*****************************************************************
003304  000004                  TST16:  SCOPE
003306  012737  000300  001160          MOV     #300,$TIMES     ;;DO 300 ITERATIONS
003314  005037  001124                  CLR     $GDDAT          ;CLEAR EXPECTED
003320  005277  175772                  INC     @STREG          ;START CONVERSION
003324  105777  175766          2$:     TSTB    @STREG
003330  100375                        BPL     2$
003332  000005                        RESET
003334  104411                        CHECK
003336  104001                        ERROR   1               ;DONE FLAG FAILED TO CLEAR
003340  052777  000100  175576        BIS     #100,@$TKS              ;SET INTRPT. EN. BIT

                                ;;*****************************************************************
                                ;*TEST 17        TEST A/D DONE FLAG CLEARS WHEN READ CONVERTED VALUE
                                ;;*****************************************************************
003346  000004                  TST17:  SCOPE
003350  005277  175742                  INC     @STREG          ;SET A/D START CONVERSION BIT
003354  105777  175736          1$:     TSTB    @STREG          ;WAIT FOR FLAG
003360  100375                        BPL     1$
003362  017700  175734                  MOV     @ADBUFF,R0      ;READ CONVERTED VALUE
003366  104411                        CHECK
003370  104001                        ERROR   1               ;DONE FLAG FAILED TO CLEAR

                                ;;*****************************************************************
                                ;*TEST 20        TEST ALL '0'S RESULTS USING MAINT. ADTST. BIT
                                ;;*****************************************************************
003372  000004                  TST20:  SCOPE
003374  005037  001124                  CLR     $GDDAT          ;CLEAR EXPECTED VALUE
003400  005037  001372                  CLR     CHANL           ;SET CHANL = 0
003404  005037  001412                  CLR     SPREAD          ;SET SPREAD = 0
003410  012777  000005  175700        MOV     #5,@STREG       ;CONVERT EVEN CHANNEL WITH MAINT. BIT SET
003416  105777  175674          1$:     TSTB    @STREG          ;WAIT FOR DONE
003422  100375                        BPL     1$
003424  017737  175672  001126        MOV     @ADBUFF,$BDDAT  ;RESULTS TO BDDAT FOR CHECKING
003432  001401                        BEQ     TST21           ;;GOTO NEXT TEST
003434  104004                        ERROR   4               ;DID NOT GET ALL '0'S RSULT WITH MAINT. ADTST

                                ;;*****************************************************************
                                ;*TEST 21        TEST ALL '1'S RESULT USING MAINT. ADTST. BIT
                                ;;*****************************************************************
003436  000004                  TST21:  SCOPE
003440  012737  007777  001124        MOV     #7777,$GDDAT    ;EXPECT ALL '1'S RESULT
003446  012737  000001  001372        MOV     #1,CHANL        ;SET CHANL = 1
003454  005037  001412                  CLR     SPREAD          ;SET SPREAD = 0
003460  012777  000405  175630        MOV     #405,@STREG     ;CONVERT ODD CHANNEL WITH MAINT. BIT SET
003466  105777  175624          1$:     TSTB    @STREG          ;WAIT FOR DONE
003472  100375                        BPL     1$
003474  017737  175622  001126        MOV     @ADBUFF,$BDDAT  ;RESULTS TO BDDAT FOR CHECKING
003502  023737  001124  001126        CMP     $GDDAT,$BDDAT   ;EQUAL?
003510  001401                        BEQ     TST22           ;;GOTO NEXT TEST
003512  104004                        ERROR   4               ;DID NOT GET ALL '1'S RESULT WITH MAINT. ADTST
```

```
                        ;;*******************************************************************
                        ;*TEST 22        GENERATE INTERRUPT WHEN DONE FLAG SETS AFTER CONVERSION
                        ;;*******************************************************************
003514  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'.
003516  012700  000022          MOV     #22,R0          ;GET TEST NO.
003522  004737  011216          JSR     PC,DUMW         ;PRINT MESSAGE
003526  005046                  CLR     -(SP)           ;RESET PRIORITY
003530  012746  003536          MOV     #3$,-(SP)
003534  000002                  RTI
003536  012777  003612  175560  3$:     MOV     #1$,@VECTOR     ;INTERRUPT VECTOR ADDRESS
003544  012777  000200  175556          MOV     #200,@VECTR1    ;SET UP NEW PSW
003552  012777  000101  175536          MOV     #BIT6!BIT0,@STREG ;SET INTERRUPT ENABLE BIT + START CONVERSION
003560  105777  175532          2$:     TSTB    @STREG          ;WAIT FOR DONE
003564  100375                  BPL     2$              ;FLAG TO SET
003566  017737  175524  001126          MOV     @STREG,$BDDAT   ;READ STATUS REGISTER
003574  012737  000300  001124          MOV     #BIT7!BIT6,$GDDAT ;GOOD DATA
003602  104002                  ERROR   2               ;FAILED TO INTERRUPT ON DONE
003604  004737  011270          JSR     PC,DUMC         ;TYPE COMPLETED
003610  000414                  BR      TST23           ;;BRANCH TO NEXT TEST
003612  022626          1$:     CMP     (SP)+,(SP)+     ;RESET STACK POINTER
003614  012777  001442  175502          MOV     #UNEXP,@VECTOR  ;SET UP FOR UNEXPECTED INTERRUPT
003622  005046                  CLR     -(SP)           ;CLEAR PSW
003624  012746  003632          MOV     #4$,-(SP)
003630  000002                  RTI
003632  004737  011270  4$:     JSR     PC,DUMC         ;TYPE COMPLETED
003636  005777  175460          TST     @ADBUFF         ;CLEAR DONE BIT
                        ;;*******************************************************************
                        ;*TEST 23        TEST INTERRUPT OCCURS WHEN ERROR AND I.E.E. IS SET
                        ;;*******************************************************************
003642  000004          TST23:  SCOPE
                        ;* 'ENTERING TEST 23'' TYPED OUT TO TELL YOU THE NEXT
                        ;*TEST THAT IS GOING TO BE EXECUTED. IT IS ONLY TYPED ON PASS 0.
                        ;*THERE IS DANGER THAT THE UNIBUS COULD GET 'HUNG' WHILE
                        ;*EXECUTING TEST '23'.
003644  012700  000023          MOV     #23,R0          ;GET TEST NO.
003650  004737  011216          JSR     PC,DUMW         ;PRINT MESSAGE
003654  012777  003714  175450          MOV     #1$,@VECTR2     ;SETUP VECTOR ADDRESS
003662  012777  140000  175426          MOV     #BIT15!BIT14,@STREG     ;CAUSE AN INTERRUPT
003670  017737  175422  001126          MOV     @STREG,$BDDAT   ;BAD DATA
003676  012737  140000  001124          MOV     #BIT15!BIT14,$GDDAT     ;GOOD DATA
003704  104002                  ERROR   2
003706  004737  011270          JSR     PC,DUMC         ;TYPE COMPLETED
003712  000627                  BR      TST20
003714  022626          1$:     CMP     (SP)+,(SP)+     ;POP STACK
003716  004737  011270          JSR     PC,DUMC
003722  005077  175370          CLR     @STREG
```

```
                                ;;*********************************************************************
                                ;*TEST 24       TEST ERROR FLAG SETS IF  2ND CONVERSION ENDS BEFORE READING BUFFER
                                ;;*********************************************************************
003726  000004                  TST24:  SCOPE
003730  012777  000001  175360          MOV     #BIT0,@STREG    ;START CONVERSION
003736  105777  175354          1$:     TSTB    @STREG          ;WAIT FOR
003742  100375                          BPL     1$
003744  012737  100200  001124  2$:     MOV     #BIT15!BIT7,$GDDAT ;LOAD EXPECTED VALUE
003752  012777  000001  175336          MOV     #BIT0,@STREG    ;START 2ND CONVERSION
003760  012700  001000                  MOV     #BIT9,R0        ;WAIT FOR 2ND
003764  005300                  3$:     DEC     R0              ;CONVERSION TO END
003766  001376                          BNE     3$
003770  104411                  4$:     CHECK
003772  104001                          ERROR   1               ;ERROR FLAG NOT SET WHEN 2ND
                                                                ; CONVERT ENDS BEFORE READ BUFFER FROM FIRST
003774  017700  175322                  MOV     @ADBUFF,R0      ;CLEAR DONE FLAG
                                ;;*********************************************************************
                                ;*TEST 25       TEST ERROR FLAG SETS IF START 2ND CONV. BEFORE DONE FLAG SETS
                                ;;*********************************************************************
004000  000004                  TST25:  SCOPE
004002  012737  100000  001124          MOV     #BIT15,$GDDAT   ;LOAD EXPECTED DATA
004010  012777  000001  175300          MOV     #BIT0,@STREG    ;START CONVERSION
004016  112777  000001  175272          MOVB    #BIT0,@STREG            ;START NEXT CONVERSION
004024  112777  000001  175264          MOVB    #BIT0,@STREG            ;ONCE AGAIN IN CASE REFRESH INTERVENED
004032  017737  175260  001126          MOV     @STREG,$BDDAT           ;READ STATUS REGISTER
004040  042737  077777  001126          BIC     #77777,$BDDAT           ;MASK OUT BIT 15
004046  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
004054  001401                          BEQ     1$              ;;BRANCH OVER ERROR
004056  104001                          ERROR   1               ;ERROR FLAG NOT SET WHEN 2ND
                                                                ;CONVERT BEGINS BEFORE FIRST DONE
004060  017700  175236          1$:     MOV     @ADBUFF,R0              ;READ CONVERTED VALUE
004064  005077  175226                  CLR     @STREG                  ;CLEAR STATUS REGISTER
004070  000004                          SCOPE
004072  000207                          RTS     PC              ;RETURN TO TEST SECTION


                                ;;SUBROUTINE FOR LOGIC TESTS;;
004074  013777  001124  175214  TESTIT: MOV     $GDDAT,@STREG           ;LOAD EXPECTED VALUE
004102  017737  175210  001126  TEST:   MOV     @STREG,$BDDAT           ;READ ST. REG.
004110  023737  001124  001126          CMP     $GDDAT,$BDDAT           ;COMPARE RESULTS
004116  001002                          BNE     RETERR          ;;ERROR RETURN
004120  062716  000002                  ADD     #2,(SP)                 ;BUMP RETURN ADDRESS TO GET AROUND ERROR
004124  000002                  RETERR: RTI
```

```
                                        .SBTTL      WRAPAROUND TEST SECTION
004126                                  WRAP:
                                        ;;**********************************************************************
                                        ;*TEST 26        TEST CH0 GROUND
                                        ;;**********************************************************************
004126  012737  000026  001102  TST26:  MOV     #$TN,$TSTNM
004134  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004142  012737  004126  001110          MOV     #TST26,$LPERR
004150  012737  004126  001106          MOV     #TST26,$LPADR
004156  004537  011036                  JSR     R5,CONVRT               ;CONVERT 8 TIMES
004162  000000                          0
004164  004537  011150                  JSR     R5,COMPAR               ;COMPARE RESULTS
004170  004000                          4000                            ;NOMINAL
004172  011616                          V12                             ;TOLERANCE
004174  104004                          ERROR   4                       ;ERROR ON A/D CHANNEL
                                        ;;**********************************************************************
                                        ;*TEST 27        TEST CH1 +4.5 VOLT
                                        ;;**********************************************************************
004176  000004  TST27:  SCOPE
004200  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004206  004537  011036                  JSR     R5,CONVRT               ;CONVERT 8 TIMES
004212  000001                          1                               ;CHANNEL 1
004214  004537  011150                  JSR     R5,COMPAR               ;COMPARE RESULTS
004220  007344                          7344                            ;NOMINAL
004222  011622                          V326                            ;TOLERANCE
004224  104004                          ERROR   4                       ;ERROR ON A/D CHANNEL

                                        ;;**********************************************************************
                                        ;*TEST 30        TEST CH2 -4.5 VOLT
                                        ;;**********************************************************************
004226  000004  TST30:  SCOPE
004230  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004236  004537  011036                  JSR     R5,CONVRT               ;CONVERT 8 TIMES
004242  000002                          2                               ;CHANNEL 2
004244  004537  011150                  JSR     R5,COMPAR               ;COMPARE RESULTS
004250  000434                          434                             ;NOMINAL
004252  011622                          V326                            ;TOLERANCE
004254  104004                          ERROR   4                       ;ERROR ON A/D CHANNEL
                                        ;;**********************************************************************
                                        ;*TEST 31        TEST GROUND ON CHANNELS 4 - 17
                                        ;;**********************************************************************
004256  000004  TST31:  SCOPE
004260  012737  000010  001160          MOV     #10,$TIMES      ;;DO 10 ITERATIONS
004266  012737  000004  004300          MOV     #4,2$           ;SET UP FIRST CHANNEL
004274  004537  011036          1$:     JSR     R5,CONVRT       ;CONVERT CHANNEL
004300  000004          2$:     4
004302  004537  011150                  JSR     R5,COMPAR       ;TEST RESULTS
004306  004000                          4000
004310  011616                          V12
004312  104004                          ERROR   4
004314  005237  004300                  INC     2$              ;GET NEXT CHANNEL
004320  022737  000017  004300          CMP     #17,2$          ;DONE?
004326  001362                          BNE     1$              ;;NO
```

```
                        ;;*****************************************************************
                        ;*TEST 32        TEST VERNIER OFFSET DAC ON CH0
                        ;;*****************************************************************
004330  000004          TST32:  SCOPE
004332  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
004340  005077  174756                  CLR     @ADBUFF                 ;SET VERNIER DAC = 0
004344  004537  011036                  JSR     R5,CONVRT               ;CONV. CH0, DIRECT VERNIER DAC
004350  000000                          0
004352  013704  001356                  MOV     TEMP,R4                 ;SAVE VALUE IN R4
004356  012777  000377  174736  1$:     MOV     #377,@ADBUFF            ;SET VERNIER DAC = 377
004364  004537  011036                  JSR     R5,CONVRT               ;CONVERT IT
004370  000000                          0
004372  160437  001356                  SUB     R4,TEMP                 ;TEMP=DIFF. BETWEEN VALUE & PREVIOUS
004376  004537  011150                  JSR     R5,COMPAR               ;COMPARE RESULTS
004402  000005                          5
004404  011612                          V2
004406  104004                          ERROR   4
                        ;;*****************************************************************
                        ;*TEST 33        OFFSET ON CH0
                        ;;*****************************************************************
004410  000004          TST33:  SCOPE
004412  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
004420  013737  001342  001372          MOV     BASECH,CHANL            ;LOAD CHANNEL
004426  013737  001342  001370          MOV     BASECH,DUMMY            ;LOAD DUMMY
004434  004737  005160                  JSR     PC,OFFSET       ;FIND OFFSET
004440  104401  013756                  TYPE    ,MOFSET         ;TYPE 'OFFSET='
004444  004737  005234                  JSR     PC,TOFF         ;TYPE OFFSET
004450  004537  011150                  JSR     R5,COMPAR       ;IS RESULT WITHIN LIMITS?
004454  000000                          0
004456  011620                          V50D
004460  000401                          BR      OFFERR          ;NO-ERROR
004462  000403                          BR      OFFOK           ;YES-OK
004464  104401  012567  OFFERR:  TYPE    ,ERMSG
004470  000402                          BR      TST34           ;;GO TO NEXT TEST
004472  104401  012245  OFFOK:   TYPE    ,OKMSG
```

```
                                ;;*****************************************************************
                                ;*TEST 34        TEST RAMP RANGE, CH3
                                ;;*****************************************************************
004476  000004                  TST34:  SCOPE
004500  012737  000001  001160          MOV     #1,$TIMES               ;DO THIS ONCE
004506  012703  007777                  MOV     #7777,R3                ;INIT R3 VALUE
004512  005004                          CLR     R4                      ;AND R4
004514  012777  001400  174574          MOV     #1400,@STREG            ;SETUP FOR CH3
004522  012702  047040                  MOV     #20000.,R2              ;SETUP FOR 20,000 CONVERSIONS
004526  105277  174564          1$:     INCB    @STREG
004532  105777  174560          2$:     TSTB    @STREG
004536  100375                          BPL     2$
004540  027704  174556                  CMP     @ADBUFF,R4
004544  003402                          BLE     3$
004546  017704  174550                  MOV     @ADBUFF,R4              ;HIT A NEW HIGH
004552  027703  174544          3$:     CMP     @ADBUFF,R3
004556  002002                          BGE     4$
004560  017703  174536                  MOV     @ADBUFF,R3              ;HIT A NEW LOW
004564  005302                  4$:     DEC     R2
004566  001357                          BNE     1$
004570  010337  001356                  MOV     R3,TEMP
004574  004537  011150                  JSR     R5,COMPAR
004600  000000                          0
004602  011610                          V0
004604  104004                          ERROR   4                       ;RAMP DIDN'T REACH LOW END OF RANGE
004606  010437  001356                  MOV     R4,TEMP
004612  004537  011150                  JSR     R5,COMPAR
004616  007777                          7777
004620  011610                          V0
004622  104004                          ERROR   4                       ;RAMP DIDN'T REACH HIGH END OF RANGE
```

```
                        ;;*****************************************************************
                        ;*TEST 35       NOISE TEST, 1 EDGE
                        ;;*****************************************************************
004624  000004          TST35:  SCOPE
004626  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
004634  104401  012004                  TYPE    ,NOIMSG
004640  005037  001372                  CLR     CHANL           ;LOAD CHANNEL 0
004644  013737  001372  001370  1$:     MOV     CHANL,DUMMY             ;LOAD DUMMY CHANNEL
004652  004737  006730                  JSR     PC,GETEDG               ;GET EDGE VALUE
004656  005037  001404                  CLR     RMS                     ;CLEAR RMS VLAUE
004662  005037  001406                  CLR     PEAK                    ;CLEAR PEAK VALUE
004666  004537  007110                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 16%
004672  000020                          16.
004674  063737  001414  001404          ADD     DAC,RMS         ;ADD RESULT TO RMS
004702  004537  007110                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 84%
004706  000124                          84.
004710  163737  001414  001404          SUB     DAC,RMS         ;SUBTRACT RESULT FROM RMS
004716  004537  007110                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 1%
004722  000001                          1
004724  063737  001414  001406          ADD     DAC,PEAK                ;ADD RESULT TO PEAK
004732  004537  007110                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 99%
004736  000143                          99.
004740  163737  001414  001406          SUB     DAC,PEAK                ;SUBTRACT RESULT FROM PEAK
004746  012737  000001  007106          MOV     #1,EDGFLG
004754  004737  010706                  JSR     PC,TYPRP                ;TYPE RMS AND PEAK VALUES
004760  005237  001372                  INC     CHANL                   ;GET NEXT CHANNEL
004764  022737  000003  001372          CMP     #3,CHANL                ;CHANNEL 3?
004772  001002                          BNE     2$              ;;NO
004774  005237  001372                  INC     CHANL           ;CHANNEL 3 IS SKIPED
005000  022737  000017  001372  2$:     CMP     #17,CHANL       ;DONE?
005006  001316                          BNE     1$              ;;NO
```

```
                                ;;*****************************************************************
                                ;*TEST 36       INTERCHANNEL SETTLING TEST, 1 EDGE
                                ;;*****************************************************************
005010  000004                  TST36:  SCOPE
005012  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
005020  104401  012023          1$:     TYPE    ,SETMSG         ;TYPE "SETTLING TEST"
005024  012737  000001  001360          MOV     #1,CH1          ;DO TEST BETWEEN CHANNEL 1 AND 2
005032  012737  000002  001362          MOV     #2,CH2
005040  013737  001362  001372          MOV     CH2,CHANL
005046  004737  006730                  JSR     PC,GETEDG       ;GET EDGE VALUES
005052  005002                          CLR     R2
005054  004737  006666                  JSR     PC,SET1A        ;SCALING = .02 LSB
005060  004737  006666                  JSR     PC,SET1A        ;MAKE IT .01 LSB
005064  100001                          BPL     2$
005066  005402                          NEG     R2              ;MAKE IT POSITIVE
005070  010204                  2$:     MOV     R2,R4
005072  012737  000001  007106          MOV     #1,EDGFLG
005100  004737  006536                  JSR     PC,TYPSET       ;TYPE SETTLING INFORMATION
005104  022737  000002  001360          CMP     #2,CH1          ;DONE?
005112  001410                          BEQ     TST37           ;;YES
005114  013702  001360                  MOV     CH1,R2          ;SETTLE THE OTHER WAY
005120  013737  001362  001360          MOV     CH2,CH1
005126  010237  001362                  MOV     R2,CH2
005132  000742                          BR      1$              ;;
005134                          3$:
                                ;;*****************************************************************
                                ;*TEST 37       DIFFERENTIAL LINEARITY AND RELATIVE ACCURACY TEST
                                ;;*****************************************************************
005134  000004                  TST37:  SCOPE
005136  012737  000001  001160          MOV     #1,$TIMES       ;;DO 1 ITERATION
005144  005737  001202                  TST     $PASS                   ;FIRST TIME-SKIP DIFLIN
005150  001402                          BEQ     LEND
005152  004737  007310                  JSR     PC,DIFLIN
005156  000207                  LEND:   RTS     PC                      ;RETURN TO TEST SECTION

005160  012737  004001  001420  OFFSET: MOV     #4001,EDGE              ;4000,4001 EDGE
005166  004537  007110                  JSR     R5,SARSUB
005172  000062                          50.
005174  013737  001414  001356          MOV     DAC,TEMP
005202  012737  004000  001420          MOV     #4000,EDGE              ;3777,4000 EDGE
005210  004537  007110                  JSR     R5,SARSUB
005214  000062                          50.
005216  063737  001414  001356          ADD     DAC,TEMP
005224  162737  000400  001356          SUB     #400,TEMP
005232  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$              ;;
```

```
 670  005436  104401  012417          AJOFF:  TYPE    ,IGND           ;GROUND CHANNEL
 671  005442  104407                          RDLIN                   ;WAIT FOR CR
 672  005444  005726                          TST     (SP)+           ;POP 1 WORD OFF STACK
 673  005446  104401  012357          1$:     TYPE    ,XADJ           ;ADJUST MESSAGE
 674  005452  104401  012456                  TYPE    ,CRWR           ;TYPE 'TYPE CR WHEN READY''
 675  005456  012703  000005                  MOV     #5,R3           ;SET UP COUNT
 676  005462  004737  005160          2$:     JSR     PC,OFFSET       ;TEST AND TYPE OFFSET ERROR
 677  005466  004737  005234                  JSR     PC,TOFF         ;TYPE OFFSET
 678  005472  004737  005256                  JSR     PC,TCHK         ;CHECK FOR A CHARACTER AND DELAY
 679  005476  000771                          BR      2$              ;;
 680  005500  000762                          BR      1$              ;;NOT WITHIN TOLLERANCE, TRY AGAIN
 681  005502  000005                          RESET
 682  005504  000137  002262                  JMP     BEG2
 683  005510  104401  012505          AJGAIN: TYPE    ,IVOLT          ;INPUT +5.115 VOLTS ON CHANNEL
 684  005514  104401  012456                  TYPE    ,CRWR
 685  005520  104407                          RDLIN                   ;WAIT FOR CR
 686  005522  005726                          TST     (SP)+           ;POP 1 WORD OFF STACK
 687  005524  104401  012551          1$:     TYPE    ,YADJ           ;ADJUST MESSAGE
 688  005530  104401  012373                  TYPE    ,MOLSB          ;TYPE '' FOR 0.00 LSB ERROR''
 689  005534  104401  012456                  TYPE    ,CRWR
 690  005540  012703  000005                  MOV     #5,R3           ;SET UP COUNT
 691  005544  012737  007777  001420  2$:     MOV     #7777,EDGE      ;LOOK FOR 7776,7777 EDGE
 692  005552  004537  007110                  JSR     R5,SARSUB
 693  005556  000062                          50.
 694  005560  013737  001414  001356          MOV     DAC,TEMP        ;SAVE DAC
 695  005566  012737  007776  001420          MOV     #7776,EDGE      ;LOOK FOR 7775,7776 EDGE
 696  005574  004537  007110                  JSR     R5,SARSUB
 697  005600  000062                          50.
 698  005602  063737  001414  001356          ADD     DAC,TEMP        ;ADD RESULTS
 699  005610  162737  000400  001356          SUB     #400,TEMP       ;OFFSET RESULT
 700  005616  004737  005234                  JSR     PC,TOFF         ;TYPE GAIN
 701  005622  004737  005256                  JSR     PC,TCHK         ;CHECK FOR CHARACTER AND DELAY
 702  005626  000746                          BR      2$              ;;
 703  005630  000735                          BR      1$              ;;NOT WITHIN TOLLERANCE, TRY AGAIN
 704  005632  000005                          RESET
 705  005634  000137  002262                  JMP     BEG2
```

```
                                .SBTTL          PRINT VALUES ROUTINE
005640  012737  005640  001374  BEGINP: MOV     #BEGINP,TADDR           ;TEST ADDRESS IN TADDR
005646  005077  173444                  CLR     @STREG                  ;CLEAR STATUS REGISTER
005652  104401  013665                  TYPE    ,HEAD5                  ;TYPE OUT HEADING
005656  005046                          CLR     -(SP)                   ;CLEAR PSW
005660  012746  005666                  MOV     #1$,-(SP)
005664  000002                          RTI
005666  017700  173246          1$:     MOV     @SWR,R0                 ;READ CHANNEL FROM SWITCH REG.
005672  042700  177700                  BIC     #177700,R0              ;ISOLATE MUX BITS
005676  032777  020000  173234          BIT     #BIT13,@SWR             ;IS BIT 13 SET?
005704  001005                          BNE     2$              ;;YES,SKIP TYPEOUT
005706  104401  012131                  TYPE    ,CH
005712  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
(1)                                                             ;;TYPE CHANNEL
005714  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
005716     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
005717     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
005720  012777  001620  173376  2$:     MOV     #RETURN,@VECTOR         ;ADDRESS AFTER INTRPT.
005726  000300                          SWAB    R0                      ;SWITCH BYTES
005730  052700  000100                  BIS     #BIT6,R0
005734  010077  173356                  MOV     R0,@STREG               ;LOAD THE CHANNEL
005740  012702  000010                  MOV     #10,R2                  ;TYPEOUT COUNTER
005744  005277  173346          3$:     INC     @STREG                  ;START CONVERSION
005750  000001                          WAIT                            ;WAIT FOR INTRPT.
005752  017700  173344                  MOV     @ADBUFF,R0              ;READ CONVERTED VALUE
005756  032777  020000  173154          BIT     #BIT13,@SWR             ;IS BIT 13 SET?
005764  001403                          BEQ     4$                      ;NOT SET, TYPE OUT LIST
005766  010077  173150                  MOV     R0,@DISPLAY                     ;PUT VALUE IN DISPLAY FOR DISPLAY CONTRO
005772  000735                          BR      1$                      ;REPEAT CONVERSION
005774  104401  012134          4$:     TYPE    ,SPACE
006000  010046                          MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
(1)                                                             ;;PRINT OCTAL CONVERTED VALUE
006002  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
006004     004                          .BYTE   4               ;;TYPE 4 DIGIT(S)
006005     001                          .BYTE   1               ;;TYPE LEADING ZEROS
006006  012701  010000                  MOV     #10000,R1
006012  005301          5$:     DEC     R1
006014  001376                  BNE     5$
006016  005302                  DEC     R2                      ;DECREMENT THE COUNTER
006020  001351                  BNE     3$                      ;NO CARRIAGE RETURN
006022  104401  001171                  TYPE    ,$CRLF                  ;CARRIAGE RETURN
006026  000717                          BR      1$                      ;REPEAT CONVERSION
```

```
                                        .SBTTL      LOGIC TEST SECTION
006030  012737  006030  001374  BEGL:   MOV     #BEGL,TADDR     ;TEST ADDRESS
006036  004737  002464                  JSR     PC,TESTAD       ;NO OF ADDITIONAL AD'S
006042  004737  002670          1$:     JSR     PC,BEGINL       ;LOGIC TESTS
006046  004737  006206                  JSR     PC,BUMPAD       ;MORE TO TEST?
006052  000773                          BR      1$              ;TEST NEXT A/D
006054  012737  006042  011646          MOV     #1$,AGTST       ;ADDRESS FOR EOP
006062  000137  011650                  JMP     $EOP            ;TYPE END OF PASS

                                        .SBTTL      AUTO TEST
006066  012737  006066  001374  BEGINA: MOV     #BEGINA,TADDR   ;TEST ADDRESS
006074  004737  002464                  JSR     PC,TESTAD       ;NO. OF AD'S TO BE TESTED
006100  004737  002670          1$:     JSR     PC,BEGINL       ;LOGIC TESTS
006104  104401  013057                  TYPE    ,MEND           ;TYPE END OF LOGIC TEST
006110  013746  001316                  MOV     STREG,-(SP)     ;SAVE STREG FOR TYPEOUT
006114  104403                          TYPOS                   ;TYPE OCTAL NUMBER
006116     006                          .BYTE   6               ;TYPE 6 DIGITS
006117     001                          .BYTE   1               ;TYPE LEADING ZEROS
006120  104401  001171                  TYPE    ,$CRLF          ;TYPE A CR,LF
006124  004737  004126                  JSR     PC,WRAP
006130  004737  006206                  JSR     PC,BUMPAD       ;TEST NEXT A/D
006134  000761                          BR      1$              ;TEST NEXT AD
006136  012737  006100  011646          MOV     #1$,AGTST       ;ADDRESS FOR EOP
006144  000137  011650                  JMP     $EOP            ;TYPE END OF PASS

                                        .SBTTL      WRAPAROUND TEST
006150  012737  006150  001374  BEGINW: MOV     #BEGINW,TADDR   ;TEST ADDRESS
006156  004737  002464                  JSR     PC,TESTAD       ;NO. OF AD'S TO BE TESTED
006162  004737  004126          1$:     JSR     PC,WRAP         ;WRAPAROUND TESTS
006166  004737  006206                  JSR     PC,BUMPAD       ;MORE A/D'S TO BE TESTED?
006172  000773                          BR      1$              ;YES-GO TEST NEXT ADV11
006174  012737  006162  011646          MOV     #1$,AGTST
006202  000137  011650                  JMP     $EOP            ;INCREMENTS $PASS
```

```
                                        .SBTTL  DETERMINE IF MORE ADV11'S TO BE TESTED
006206  005737  001364          BUMPAD: TST     NBEXT                   ;ADDITIONAL AD'S?
006212  001434                          BEQ     FIXADR                  ;NO-INITIALIZE ADDRESSES
006214  006337  001440                  ASL     TSTBIT          ;MOVE BIT TO NEXT MODULE
006220  063737  001336  001316          ADD     VADR,STREG              ;SET UP NEW ST. REG.
006226  063737  001336  001320          ADD     VADR,ADST1              ;SET UP NEW ADST1
006234  063737  001336  001322          ADD     VADR,ADBUFF             ;SET UP NEW BUFFER ADDRESS
006242  063737  001340  001324          ADD     VVCT,VECTOR             ;SET UP NEW VECTOR
006250  063737  001340  001330          ADD     VVCT,VECTR1
006256  063737  001340  001332          ADD     VVCT,VECTR2
006264  063737  001340  001334          ADD     VVCT,VECTR3
006272  005077  173032                  CLR     @VECTR1
006276  005337  001364                  DEC     NBEXT                   ;ONE LESS ADV11
006302  000473                          BR      BYPASS
006304  062716  000002          FIXADR: ADD     #2,(SP)
006310  012737  000006  000004  FIXONE: MOV     #6,@#ERRVEC             ;SET UP ERRVEC
006316  012737  007302  000010          MOV     #DELAY4,@#RESVEC        ;SETUP RESERVED INST. VECTOR
006324  012737  000001  001440          MOV     #1,TSTBIT       ;INITIALIZE MODULE ERROR TEST BIT
006332  013737  001250  001316          MOV     $BASE,STREG             ;RELOAD INITIAL ADDRESSES
006340  013737  001250  001320          MOV     $BASE,ADST1
006346  013737  001250  001322          MOV     $BASE,ADBUFF
006354  005237  001320                  INC     ADST1
006360  062737  000002  001322          ADD     #2,ADBUFF
006366  013737  001244  001324          MOV     $VECT1,VECTOR
006374  042737  170000  001324          BIC     #170000,VECTOR
006402  113737  001245  001326          MOVB    $VECT1+1,BASEBR
006410  105037  001327                  CLRB    BASEBR+1                ;CLEAR HIGH BYTE
006414  013737  001324  001330          MOV     VECTOR,VECTR1
006422  062737  000002  001330          ADD     #2,VECTR1
006430  013737  001324  001332          MOV     VECTOR,VECTR2
006436  062737  000004  001332          ADD     #4,VECTR2
006444  013737  001324  001334          MOV     VECTOR,VECTR3
006452  062737  000006  001334          ADD     #6,VECTR3
006460  005077  172644                  CLR     @VECTR1
006464  013737  001366  001364          MOV     NMBEXT,NBEXT            ;RESET COUNTER
                                ;;LOAD .+2 AND HALT TRAP CATCH;;
006472  012700  000216          BYPASS: MOV     #216,R0                 ;FILL .+2
006476  012701  000214                  MOV     #214,R1                 ;LOAD HALT
006502  020137  001344          1$:     CMP     R1,KBVECT
006506  001410                          BEQ     2$
006510  010021                          MOV     R0,(R1)+
006512  005021                          CLR     (R1)+
006514  010100                          MOV     R1,R0
006516  005720                          TST     (R0)+
006520  020027  001002                  CMP     R0,#1002
006524  001366                          BNE     1$
006526  000207                          RTS     PC                      ;TEST NEXT A/D
006530  022021                  2$:     CMP     (R0)+,(R1)+
006532  022021                          CMP     (R0)+,(R1)+
006534  000762                          BR      1$
```

```
  827  006536  104413                    TYPSET: TYPDC
  828  006540  104401  012141                    TYPE    ,LSB
  829  006544  013746  001362                    MOV     CH2,-(SP)       ;;SAVE CH2 FOR TYPEOUT
  (1)                                             ;;TYPE CH
  (1)  006550  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
  (1)  006552     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
  (1)  006553     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
  830  006554  104401  013777                  TYPE    ,MAT            ;TYPE ASCIZ STRING
  831  006560  004737  007044                  JSR     PC,TYPEDG
  832  006564  104401  012154                  TYPE    ,SETCH
  833  006570  013746  001360                  MOV     CH1,-(SP)       ;;SAVE CH1 FOR TYPEOUT
  (1)                                             ;;TYPE CH
  (1)  006574  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
  (1)  006576     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
  (1)  006577     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
  834  006600  104401  012176                  TYPE    ,ATMSG
  835  006604  013737  001360  006632          MOV     CH1,1$
  836  006612  163737  001342  006632          SUB     BASECH,1$
  837  006620  012777  000200  172474          MOV     #200,@ADBUFF
  838  006626  004537  011036                  JSR     R5,CONVRT
  839  006632  000000                  1$:     0
  840  006634  013746  001356                  MOV     TEMP,-(SP)      ;;SAVE TEMP FOR TYPEOUT
  (1)                                             ;;TYPE VALUE
  (1)  006640  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
  (1)  006642     004                          .BYTE   4               ;;TYPE 4 DIGIT(S)
  (1)  006643     001                          .BYTE   1               ;;TYPE LEADING ZEROS
  841  006644  020437  011630                  CMP     R4,VSET
  842  006650  003003                          BGT     ERR
  843  006652  104401  012245                  TYPE    ,OKMSG
  844  006656  000207                          RTS     PC
  845  006660  104401  012567          ERR:    TYPE    ,ERMSG
  846  006664  000207                          RTS     PC
  847
  848                                    ;;SUBROUTINE FOR SETTLING TESTS;;
  849  006666  013737  001362  001370  SET1A: MOV     CH2,DUMMY               ;LOAD DUMMY
  850  006674  004537  007110                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 50%
  851  006700  000062                          50.
  852  006702  063702  001414                  ADD     DAC,R2          ;ADD RESULT TO R2
  853  006706  013737  001360  001370          MOV     CH1,DUMMY               ;CHANGE DUMMY VALUE
  854  006714  004537  007110                  JSR     R5,SARSUB               ;DO SAR ROUTINE AT 50%
  855  006720  000062                          50.
  856  006722  163702  001414                  SUB     DAC,R2          ;SUBTRACT RESULT FROM R2
  857  006726  000207                          RTS     PC              ;RETURN
```

```
                                        ;SUBROUTINE TO GET EDGE VALUE
                                        ;CALL=JSR   PC,GETEDG
                                        ;CONVERSIONS ON A/D CHANNEL 'CHANL'
                                        ;RESULT IN EDGE, USES R0
006730  012777  000200  172364  GETEDG: MOV     #200,@ADBUFF    ;LOAD VERNIER DAC
006736  113700  001372                  MOVB    CHANL,R0                ;GET CHANNEL
006742  000300                          SWAB    R0              ;SET UP A.D STATUS REG.
006744  052700  000100                  BIS     #100,R0         ;ENABLE INTPPT.
006750  010077  172342                  MOV     R0,@STREG
006754  012700  000100                  MOV     #100,R0         ;DAC SETTLING DELAY
006760  005300                  1$:     DEC     R0
006762  001376                          BNE     1$
006764  005037  001420                  CLR     EDGE
006770  012700  000010                  MOV     #10,R0
006774  012777  001620  172322          MOV     #RETURN,@VECTOR         ;RETURN ADDRESS
007002  005277  172310          CONV:   INC     @STREG                  ;START CONVERSION
007006  000001                          WAIT                            ;WAIT FOR INTERRUPT
007010  067737  172306  001420          ADD     @ADBUFF,EDGE
007016  005300                          DEC     R0
007020  001370                          BNE     CONV
007022  006237  001420                  ASR     EDGE
007026  006237  001420                  ASR     EDGE
007032  006237  001420                  ASR     EDGE
007036  005537  001420                  ADC     EDGE
007042  000207                          RTS     PC

                                        ;;SUBROUTINE TO TYPE EDGE VALUES;;
007044  013703  001420          TYPEDG: MOV     EDGE,R3
007050  010346                          MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
(1)                                                             ;;TYPE OCTAL VALUE OF EDGE
(1)     007052  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)     007054     004                  .BYTE   4               ;;TYPE 4 DIGIT(S)
(1)     007055     001                  .BYTE   1               ;;TYPE LEADING ZEROS
007056  023727  007106  000001          CMP     EDGFLG,#1
007064  001407                          BEQ     RET
007066  062703  000007                  ADD     #7,R3
007072  104401  012045                  TYPE    ,MINUS          ;TYPE ASCIZ STRING
007076  010346                          MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
(1)                                                             ;;TYPE EDGE VALUE
(1)     007100  104403                  TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)     007102     004                  .BYTE   4               ;;TYPE 4 DIGIT(S)
(1)     007103     001                  .BYTE   1               ;;TYPE LEADING ZEROS
007104  000207          RET:    RTS     PC
007106  000000          EDGFLG: 0
```

```
                                        ;SUBROUTINE TO DO SUCCESSIVE APPROXIMATION ROUTINE
                                        ;CALL=JSR   R5,SARSUB
                                          ;  XXX;XXX=PERCENT
                                        ;RESULT RETURNED IN 'DAC',USES R0,R1,R4
007110  012537  001432          SARSUB: MOV     (R5)+,PERCNT            ;GET PERCENT
007114  006337  001432                  ASL     PERCNT
007120  006337  001432                  ASL     PERCNT
007124  006337  001432                  ASL     PERCNT                  ;RESCALE PERCENT FOR 1600.
007130  006337  001432                  ASL     PERCNT                  ;POINTS PER BURST
007134  012737  000200  001422  SAR1:   MOV     #200,BITPNT             ;INITIALIZE BIT POINTER AT MSB
007142  005037  001414                  CLR     DAC                     ;INITIALIZE DAC VALUE
007146  005000                  TRY:    CLR     R0
007150  063737  001422  001414          ADD     BITPNT,DAC              ;TRY BIT
007156  013777  001414  172136          MOV     DAC,@ADBUFF
007164  012701  003100                  MOV     #1600.,R1               ;SET UP FOR 1600. CONVERSIONS
007170  113777  001370  172122  NXTCVT: MOVB    DUMMY,@ADST1            ;PRESET MUX TO DUMMY CHANNEL
007176  012777  001620  172120          MOV     #RETURN,@VECTOR         ;RETURN ADDRESS
007204  052777  000101  172104          BIS     #101,@STREG             ;CONVERSION ON DUMMY CHANNEL
007212  000001                          WAIT                            ;WAIT FOR INTERRUPT
007214  017704  172102                  MOV     @ADBUFF,R4              ;DUMMY READ
007220  013704  001372                  MOV     CHANL,R4
007224  000304                          SWAB    R4
007226  052704  000101                  BIS     #101,R4                 ;INTERRUPT ENABLE START
007232  010477  172060                  MOV     R4,@STREG               ;JUMP TO CHANNEL + START CONVERT
007236  000001                          WAIT                            ;WAIT FOR INTERRUPT
007240  027737  172056  001420          CMP     @ADBUFF,EDGE
007246  002001                          BGE     2$
007250  005200                          INC     R0                      ;COUNT RESULTS .LT. EDGE
007252  005301                  2$:     DEC     R1
007254  001345                          BNE     NXTCVT
007256  020037  001432                  CMP     R0,PERCNT
007262  003003                          BGT     SHIFT
007264  163737  001422  001414          SUB     BITPNT,DAC              ;TAKE THE BIT OUT
007272  006237  001422          SHIFT:  ASR     BITPNT
007276  001323                          BNE     TRY
007300  000205                          RTS     R5

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

007302  005300                  DELAY4: DEC     R0              ;DECREMENT R0, IS IT ZERO?
007304  001376                          BNE     DELAY4          ;NO
007306  000002                          RTI                     ;RETURN
```

```
                                        ;;DIFFERENTIAL LINEARITY SUBROUTINE;;
007310  104401  013202        DIFLIN: TYPE    ,MSG20
007314  013702  001376                MOV     RNA,R2          ;SET UP RANDOM NUMBER GENERATOR
007320  013704  001400                MOV     RNB,R4
007324  013705  001402                MOV     RNC,R5
007330  012700  017776                MOV     #BUFFER,R0
007334  012701  010000                MOV     #4096.,R1       ;4096 WORDS FOR HISTOGRAM
007340  005020                CLEAR1: CLR     (R0)+           ;CLEAR BUFFER AREA
007342  005301                        DEC     R1
007344  001375                        BNE     CLEAR1
007346  012700  017156                MOV     #DIST,R0        ;DISTRIBUTION BUFFER POINTER
007352  012701  000310                MOV     #200.,R1        ;200. WORDS FOR DISTRIBUTION
007356  005003                        CLR     R3
007360  005037  001434                CLR     OUT
007364  005037  001346                CLR     WIDE
007370  005037  001350                CLR     NARROW
007374  005037  001352                CLR     FIRST
007400  005037  001354                CLR     SKIPST
007404  005020                CLEAR2: CLR     (R0)+           ;CLEAR DISTRIBUTION BUFFER AREA
007406  005301                        DEC     R1
007410  001375                        BNE     CLEAR2
007412  012700  000003        CHANNL: MOV     #3,R0           ;CHANNEL 3
007416  063700  001342                ADD     BASECH,R0
007422  000300                        SWAB    R0                              ;LOAD MUX BITS
007424  052700  000100                BIS     #100,R0
007430  010077  171662                MOV     R0,@STREG
007434  012737  001440  001416        MOV     #800.,DELAY     ;NOMINAL STATE WIDTH - 1 LSB
007442  012777  001630  171654        MOV     #RETI,@VECTOR
007450  012701  007776        AGAIN:  MOV     #4094.,R1
007454  060402                NEXT:   ADD     R4,R2
007456  060502                        ADD     R5,R2
007460  005502                        ADC     R2
007462  060204                        ADD     R2,R4
007464  060504                        ADD     R5,R4
007466  005504                        ADC     R4
007470  060205                        ADD     R2,R5
007472  060405                        ADD     R4,R5
007474  005505                        ADC     R5
007476  042700  177770                BIC     #177770,R0      ;MASK IT TO 4 BITS ONLY
007502  001401                        BEQ     CONVR
007504  077001                DELAY3: SOB     R0,DELAY3       ;STALL TIME
007506  005277  171604        CONVR:  INC     @STREG          ;START CONVERSION
007512  000001                        WAIT
007514  000240                        NOP
007516  017700  171600                MOV     @ADBUFF,R0      ;GET CONVERTED VALUE
007522  001416                        BEQ     DELAY1          ;IGNORE IF =0
007524  020027  007777                CMP     R0,#7777        ;IGNORE IF =7777
007530  001416                        BEQ     DELAY2
007532  006300                        ASL     R0
007534  005260  017776                INC     BUFFER(R0)      ;MAKE HISTOGRAM
007540  100016                        BPL     OKAY
007542  012760  077777  017776        MOV     #077777,BUFFER(R0)      ;PREVENT OVERFLOW
007550  000412                        BR      OKAY
```

```
  993  007552  005037  001356          NOTOK:  CLR     TEMP
  994  007556  000407                          BR      OKAY
  995  007560  020027  007777          DELAY1: CMP     R0,#7777        ;EQUALIZE LOOP TIME
  996  007564  001400                          BEQ     DELAY2          ;WITH DUMMY INSTR.
  997  007566  005201                  DELAY2: INC     R1
  998  007570  005263  001356                  INC     TEMP(R3)
  999  007574  100766                          BMI     NOTOK
 1000  007576  005301                  OKAY:   DEC     R1
 1001  007600  001325                          BNE     NEXT
 1002  007602  005337  001416          AROUND: DEC     DELAY
 1003  007606  001320                          BNE     AGAIN
 1004  007610  012700  007776                  MOV     #4094.,R0
 1005  007614  012701  020000                  MOV     #BUFFER+2,R1
 1006  007620  012102                  READ:   MOV     (R1)+,R2        ;GET STATE WIDTH
 1007  007622  006202                          ASR     R2              ;1 LSB = 800.
 1008  007624  006202                          ASR     R2
 1009  007626  006202                          ASR     R2
 1010  007630  005502                          ADC     R2              ;1 LSB = 100.
 1011  007632  020227  000310                  CMP     R2,#200.        ;OUT OF RANGE?
 1012  007636  002403                          BLT     INRNGE
 1013  007640  005237  001434                  INC     OUT             ;YES - INCREMENT COUNTER
 1014  007644  000423                          BR      TYPBAD
 1015  007646  006302                  INRNGE: ASL     R2
 1016  007650  005262  017156                  INC     DIST(R2)        ;MAKE STATE WIDTH DISTRIBUTION
 1017  007654  006202                          ASR     R2
 1018  007656  020227  000062                  CMP     R2,#50.         ;IS IT 1/2 LSB?
 1019  007662  002007                          BGE     NOTNAR
 1020  007664  005237  001350                  INC     NARROW
 1021  007670  005702                          TST     R2              ;IS IT A SKIPPED STATE?
 1022  007672  001002                          BNE     31$
 1023  007674  005237  001354                  INC     SKIPST
 1024  007700  000405                  31$:    BR      TYPBAD
 1025  007702  020227  000226          NOTNAR: CMP     R2,#150.        ;IS IT 1.5 LSB?
 1026  007706  003425                          BLE     LAST
 1027  007710  005237  001346                  INC     WIDE
 1028  007714  005737  001352          TYPBAD: TST     FIRST
 1029  007720  001004                          BNE     60$
 1030  007722  005237  001352                  INC     FIRST
 1031  007726  104401  012111                  TYPE    ,STATE
 1032  007732  010103                  60$:    MOV     R1,R3
 1033  007734  162703  020000                  SUB     #BUFFER+2,R3
 1034  007740  006203                          ASR     R3
 1035  007742  010346                          MOV     R3,-(SP)        ;;SAVE R3 FOR TYPEOUT
  (1)                                                                  ;;TYPE STATE
  (1)  007744  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
  (1)  007746     004                          .BYTE   4               ;;TYPE 4 DIGIT(S)
  (1)  007747     001                          .BYTE   1               ;;TYPE LEADING ZEROS
 1036  007750  104401  012105                  TYPE    ,DASH
 1037  007754  104413                          TYPDC
 1038  007756  104401  012076                  TYPE    ,LSBMSG
```

```
1040  007762  005300                LAST:   DEC     R0
1041  007764  001315                        BNE     READ
1042  007766  112737  000177  014562        MOVB    #177,DECPNT
1043  007774  013702  001354                MOV     SKIPST,R2               ;GET NO. OF SKIPPED STATES
1044  010000  104413                        TYPDC                           ;TYPE IT
1045  010002  104401  012604                TYPE    ,SKPMSG         ;TYPE MESSAGE
1046  010006  005737  001354                TST     SKIPST
1047  010012  001403                        BEQ     1$
1048  010014  104401  012567                TYPE    ,ERMSG          ;TYPE 'ERROR'
1049  010020  000402                        BR      NAR
1050  010022  104401  012245        1$:     TYPE    ,OKMSG          ;TYPE #OK#
1051  010026  013702  001350        NAR:    MOV     NARROW,R2               ;GET NO. OF NARROW STATES
1052  010032  104413                        TYPDC                           ;TYPE IT
1053  010034  104401  012626                TYPE    ,NARMSG         ;TYPE MESSAGE
1054  010040  013702  001346                MOV     WIDE,R2
1055  010044  063702  001434                ADD     OUT,R2
1056  010050  104413                        TYPDC                           ;TYPE NO. OF WIDE STATES
1057  010052  104401  012665                TYPE    ,WIDMSG         ;TYPE MESSAGE
1058  010056  013702  001434                MOV     OUT,R2
1059  010062  104413                        TYPDC                           ;TYPE NO. OF STATES OUTSIDE 2 LSB
1060  010064  104401  012724                TYPE    ,OUTMSG         ;TYPE MESSAGE
1061  010070  005737  001434                TST     OUT
1062  010074  001403                        BEQ     11$
1063  010076  104401  012567                TYPE    ,ERMSG          ;TYPE 'ERROR'
1064  010102  000402                        BR      HALF
1065  010104  104401  012245        11$:    TYPE    ,OKMSG          ;TYPE 'OK'
1066  010110  013702  001350        HALF:   MOV     NARROW,R2
1067  010114  063702  001346                ADD     WIDE,R2
1068  010120  063702  001434                ADD     OUT,R2
1069  010124  010200                        MOV     R2,R0
1070  010126  104413                        TYPDC                           ;TYPE NO. OF STATES OUTSIDE LIMITS
1071  010130  112737  000056  014562        MOVB    #56,DECPNT
1072  010136  104401  012757                TYPE    ,HAFMSG
1073  010142  020027  000051                CMP     R0,#41.         ;COMPARE IT TO NOMINAL
1074  010146  003403                        BLE     21$
1075  010150  104401  012567                TYPE    ,ERMSG          ;TYPE 'ERROR'
1076  010154  000402                        BR      SWDIST
1077  010156  104401  012245        21$:    TYPE    ,OKMSG          ;TYPE 'OK'
1078  010162  005737  001410        SWDIST: TST     FLAG            ;VT55?
1079  010166  001426                        BEQ     RELACC
!080  010170  004737  010646                JSR     PC,DELCLR       ;WAIT AWHILE, THEN CLEAR VT55
1081  010174  104401  013234                TYPE    ,MSG16
1082  010200  104401  014026                TYPE    ,BUFF1          ;TYPE BUFF1-PRINT GRID
1083  010204  012700  017156                MOV     #DIST,R0        ;POINTER TO STATE WIDTH DISTRIBUTION
1084  010210  012701  000310                MOV     #200.,R1        ;GO 200. TIMES UP TO 2 LSB
1085  010214  012002                NXTY1:  MOV     (R0)+,R2
1086  010216  004737  011342                JSR     PC,LOADY
1087  010222  005002                        CLR     R2
1088  010224  004737  011342                JSR     PC,LOADY
1089  010230  005301                        DEC     R1
1090  010232  001370                        BNE     NXTY1
1091  010234  104401  013747                TYPE    ,C2             ;TYPE ASCIZ STRING
1092  010240  004737  010646                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     L02
                                        MOV     #BUFFER,R0
                                        MOV     #4096.,R1
```

```
1136  010424  011002                GETDAT: MOV     (R0),R2         ;GET RELATIVE ACCURACY ERROR SCALED 1LSB = 800.
1137  010426  006202                        ASR     R2              ;RESCALE IT TO 1 LSB = 100.
1138  010430  006202                        ASR     R2
1139  010432  006202                        ASR     R2
1140  010434  005502                        ADC     R2
1141  010436  062702  000166              ADD     #118.,R2        ;AND MOVE IT TO MID-SCREEN
1142  010442  010220                      MOV     R2,(R0)+        ;PUT IT BACK INTO BUFFER
1143  010444  005301                      DEC     R1
1144  010446  001366                      BNE     GETDAT
1145  010450  012700  017776              MOV     #BUFFER,R0
1146  010454  012704  017776              MOV     #BUFFER,R4
1147  010460  012705  020000              MOV     #BUFFER+2,R5
1148  010464  012701  001000              MOV     #512.,R1
1149  010470  012702  000007      NXT8:   MOV     #7.,R2
1150  010474  012003                      MOV     (R0)+,R3
1151  010476  010337  001424              MOV     R3,MIN          ;MINIMUM
1152  010502  010337  001430              MOV     R3,MAX          ;MAXIMUM
1153  010506  012003              NXTCMP: MOV     (R0)+,R3
1154  010510  020337  001424              CMP     R3,MIN
1155  010514  002002                      BGE     MAXTST
1156  010516  010337  001424              MOV     R3,MIN          ;NEW MINIMUM
1157  010522  020337  001430      MAXTST: CMP     R3,MAX
1158  010526  003402                      BLE     TST8
1159  010530  010337  001430              MOV     R3,MAX          ;NEW MAXIMUM
1160  010534  005302              TST8:   DEC     R2
1161  010536  001363                      BNE     NXTCMP
1162  010540  013724  001424              MOV     MIN,(R4)+
1163  010544  013725  001430              MOV     MAX,(R5)+
1164  010550  022425                      CMP     (R4)+,(R5)+     ;BUMP EACH ONCE MORE
1165  010552  005301                      DEC     R1
1166  010554  001345                      BNE     NXT8
1167  010556  104401  013142              TYPE    ,MSG18
1168  010562  104401  014054              TYPE    ,BUFF2          ;TYPE BUFF2
1169  010566  012700  017776              MOV     #BUFFER,R0
1170  010572  004737  010624              JSR     PC,LOAD
1171  010576  104401  013754              TYPE    ,C3             ;TYPE ASCIZ STRING
1172  010602  012700  020000              MOV     #BUFFER+2,R0
1173  010606  004737  010624              JSR     PC,LOAD
1174  010612  104401  013747              TYPE    ,C2             ;TYPE ASCIZ STRING
1175  010616  004737  010646              JSR     PC,DELCLR
1176  010622  000207              LO2:    RTS     PC
1177  010624  012701  001000      LOAD:   MOV     #512.,R1
1178  010630  012002              LOAD0:  MOV     (R0)+,R2
1179  010632  005720                      TST     (R0)+
1180  010634  004737  011342              JSR     PC,LOADY
1181  010640  005301                      DEC     R1
1182  010642  001372                      BNE     LOAD0
1183  010644  000207                      RTS     PC
```

```
1185  010646  032777  010000  170264  DELCLR: BIT     #BIT12,@SWR     ;TEST FOR HALT FOR DISPLAY
1186  010654  001402                          BEQ     1$              ;;DON'T HALT FOR DISPLAY
1187  010656  000000                          HALT
1188  010660  000407                          BR      3$              ;;
1189  010662  005000                  1$:     CLR     R0
1190  010664  012701  000020                  MOV     #20,R1          ;DELAY BEFORE CLEANING SCREEN
1191  010670  005300                  2$:     DEC     R0
1192  010672  001376                          BNE     2$
1193  010674  005301                          DEC     R1
1194  010676  001374                          BNE     2$
1195  010700  104401  014074          3$:     TYPE    ,VTINIT
1196  010704  000207                          RTS     PC
1197                                  ;;TYPE RMS AND PEAK VALUES;;
1198  010706  104401  012203          TYPRP:  TYPE    ,NOI
1199  010712  005737  001404                  TST     RMS
1200  010716  100002                          BPL     POSRMS
1201  010720  005037  001404                  CLR     RMS                     ;RMS<0,SET RMS=0
1202  010724  005737  001406          POSRMS: TST     PEAK
1203  010730  100002                          BPL     POSPEA
1204  010732  005037  001406                  CLR     PEAK                    ;PEAK<0,SET PEAK=0
1205  010736  013702  001404          POSPEA: MOV     RMS,R2
1206  010742  104413                          TYPDC
1207  010744  104401  013026                  TYPE    ,MESR           ;TYPE '' LSB RMS, ''
1208  010750  013702  001406                  MOV     PEAK,R2
1209  010754  104413                          TYPDC
1210  010756  104401  013041                  TYPE    ,MESP           ;TYPE '' LSB PEAK AT ''
1211  010762  004737  007044                  JSR     PC,TYPEDG
1212  010766  104401  012213                  TYPE    ,CHAN           ;TYPE '' ON CHANNEL ''
1213  010772  013746  001372                  MOV     CHANL,-(SP)     ;;SAVE CHANL FOR TYPEOUT
(1)                                                                     ;;TYPE CHANL
(1)   010776  104403                          TYPOS                   ;;GO TYPE--OCTAL ASCII
(1)   011000     002                          .BYTE   2               ;;TYPE 2 DIGIT(S)
(1)   011001     000                          .BYTE   0               ;;SUPPRESS LEADING ZEROS
1214  011002  023737  001404  011624          CMP     RMS,VNR         ;WITHIN LIMITS?
1215  011010  003007                          BGT     ER
1216  011012  023737  001406  011626          CMP     PEAK,VNP                ;WITHIN LIMITS?
1217  011020  003003                          BGT     ER
1218  011022  104401  012245                  TYPE    ,OKMSG
1219  011026  000207                          RTS     PC
1220  011030  104401  012567          ER:     TYPE    ,ERMSG
1221  011034  000207                          RTS     PC
```

```
1223                                    ;;ROUTINE TO AVERAGE 8 CONVERSIONS;;
1224  011036  012500                    CONVRT: MOV     (R5)+,R0                ;GET CHANNEL VALUE
1225  011040  063700  001342                    ADD     BASECH,R0
1226  011044  010037  001372                    MOV     R0,CHANL
1227  011050  000300                            SWAB    R0
1228  011052  005037  001356                    CLR     TEMP
1229  011056  010077  170234                    MOV     R0,@STREG               ;LOAD CHANNEL INTO MIX BITS
1230  011062  012700  010000                    MOV     #10000,R0
1231  011066  005300                    2$:     DEC     R0
1232  011070  001376                            BNE     2$
1233  011072  012777  001620  170224            MOV     #RETURN,@VECTOR         ;LOAD VECTOR
1234  011100  012700  000010                    MOV     #10,R0          ;SET UP COUNTER
1235  011104  152777  000101  170204  1$:      BISB    #101,@STREG             ;SET INTRPT. EN., START CONV.
1236  011112  000001                            WAIT                    ;WAIT FOR CONVERSION
1237  011114  067737  170202  001356            ADD     @ADBUFF,TEMP            ;READ BUFFER
1238  011122  005300                            DEC     R0
1239  011124  001367                            BNE     1$              ;DO 8 TIMES
1240  011126  006237  001356                    ASR     TEMP            ;AVERAGE VALUE
1241  011132  006237  001356                    ASR     TEMP
1242  011136  006237  001356                    ASR     TEMP
1243  011142  005537  001356                    ADC     TEMP
1244  011146  000205                            RTS     R5              ;RETURN
1245
1246                                    ;COMPARE $GDDAT AND $BDDAT;;
1247  011150  012537  001124           COMPAR: MOV     (R5)+,$GDDAT            ;GET GOOD DATA
1248  011154  013537  001412                    MOV     @(R5)+,SPREAD           ;GET SPREAD
1249  011160  013737  001356  001126            MOV     TEMP,$BDDAT             ;GET BAD(ACTUAL) DATA
1250  011166  013701  001126                    MOV     $BDDAT,R1
1251  011172  013700  001124                    MOV     $GDDAT,R0
1252  011176  160100                            SUB     R1,R0           ;GET DIFFERENCE
1253  011200  100001                            BPL     7$
1254  011202  005400                            NEG     R0
1255  011204  020037  001412           7$:     CMP     R0,SPREAD               ;COMPARE IT TO SPREAD
1256  011210  003001                            BGT     10$             ;GO TO ERROR PRINTOUT
1257  011212  005725                            TST     (R5)+           ;BUMP RETURN POINTER AROUND ERROR CALL
1258  011214  000205                    10$:    RTS     R5
```

```
                                ;;SUBROUTINE TO TYPE INTRPT. TST MSG.;;
011216  005737  001202  DUMW:  TST     $PASS
011222  001021                 BNE     20$
011224  012737  011266  001110         MOV     #20$,$LPERR
011232  012737  011266  001106         MOV     #20$,$LPADR
011240  104401  014004               TYPE    ,METST          ;TYPE ASCIZ STRING
011244  010046                       MOV     R0,-(SP)        ;;SAVE R0 FOR TYPEOUT
                                                             ;;TYPE TEST NO.
011246  104403                       TYPOS                   ;;GO TYPE--OCTAL ASCII
011250     002                       .BYTE   2               ;;TYPE 2 DIGIT(S)
011251     000                       .BYTE   0               ;;SUPPRESS LEADING ZEROS
011252  104401  013103               TYPE    ,ONAD
011256  013746  001316               MOV     STREG,-(SP)     ;;SAVE STREG FOR TYPEOUT
                                                             ;;TYPE BUS ADDRESS
011262  104403                       TYPOS                   ;;GO TYPE--OCTAL ASCII
011264     006                       .BYTE   6               ;;TYPE 6 DIGITS
011265     001                       .BYTE   1               ;;TYPE LEADING ZEROS
011266  000207          20$:   RTS     PC

011270  005737  001202  DUMC:  TST     $PASS
011274  001010                 BNE     30$
011276  012737  011316  001110         MOV     #30$,$LPERR
011304  012737  011316  001106         MOV     #30$,$LPADR
011312  104401  012230               TYPE    ,DONE
011316  000207          30$:   RTS     PC
```

```
1278                                    ;SUBROUTINE TO RESET & SET INTRPT. EN.;
1279  011320  000005                   RST:    RESET
1280  011322  052777  000100  167614          BIS     #100,@$TKS
1281  011330  005046                          CLR     -(SP)           ;CLEAR PSW
1282  011332  012746  011340                  MOV     #1$,-(SP)
1283  011336  000002                          RTI
1284  011340  000207                   1$:     RTS     PC
1285
1286                                    ;SUBROUTINE LOADY;
1287  011342  005702                   LOADY:  TST     R2              ;ROUTINE TO LOAD VLAUE INTO R2
1288  011344  100001                          BPL     PLUSR2          ;AS A VT55 Y-VALUE
1289  011346  005002                          CLR     R2
1290  011350  020227  000353           PLUSR2: CMP     R2,#235.
1291  011354  002402                          BLT     LESS
1292  011356  012702  000353                  MOV     #235.,R2
1293  011362  010203                   LESS:   MOV     R2,R3
1294  011364  042702  177740                  BIC     #177740,R2
1295  011370  052702  000040                  BIS     #40,R2
1296  011374  105777  167550           B10:    TSTB    @$TPS           ;PRINT CHARACTER
1297  011400  100375                          BPL     B10
1298  011402  110277  167544                  MOVB    R2,@$TPB
1299  011406  006203                          ASR     R3
1300  011410  006203                          ASR     R3
1301  011412  006203                          ASR     R3
1302  011414  006203                          ASR     R3
1303  011416  006203                          ASR     R3
1304  011420  042703  177770                  BIC     #177770,R3
1305  011424  052703  000040                  BIS     #40,R3
1306  011430  105777  167514           B11:    TSTB    @$TPS           ;PRINT CHARACTER
1307  011434  100375                          BPL     B11
1308  011436  110377  167510                  MOVB    R3,@$TPB
1309  011442  000207                          RTS     PC
```

```
                                        ;;SUBROUTINE TO TYPE DECIMAL VALUE;;
                                        ;;IN R2 AS X.XX;;
011444  005702                DECTYP: TST     R2              ;TEST VALUE TO BE TYPED
011446  100003                        BPL     POS
011450  104401  012045                TYPE    ,MINUS                  ;TYPE MINUS SIGN
011454  005402                        NEG     R2
011456  020227  001747        POS:    CMP     R2,#999.                ;>999. REPLACE IT WITH 999.
011462  003402                        BLE     OKAYD
011464  012702  001747                MOV     #999.,R2
011470  105037  014564        OKAYD:  CLRB    ONES            ;CLEAR ONES
011474  105037  014563                CLRB    TENS            ;CLEAR TENS
011500  105037  014561                CLRB    HUNS            ;CLEAR HUNS
011504  005702                TESTR2: TST     R2                      ;CONVERT VALUE TO A DECIMAL VALUE
011506  001424                        BEQ     TYPOUT
011510  005302                        DEC     R2
011512  105237  014564                INCB    ONES
011516  123727  014564  000012        CMPB    ONES,#10.
011524  001367                        BNE     TESTR2
011526  105037  014564                CLRB    ONES
011532  105237  014563                INCB    TENS
011536  123727  014563  000012        CMPB    TENS,#10.
011544  001357                        BNE     TESTR2
011546  105037  014563                CLRB    TENS
011552  105237  014561                INCB    HUNS
011556  000752                        BR      TESTR2
011560  152737  000060  014561  TYPOUT: BISB    #60,HUNS                ;PREPARE FOR TYPOUT
011566  152737  000060  014563        BISB    #60,TENS
011574  152737  000060  014564        BISB    #60,ONES
011602  104401  014561                TYPE    ,HUNS           ;TYPE VALUE
011606  000002                        RTI
011610  000000                V0:     0                       ;TOLERANCE VALUES FOR FUNCTIONAL TESTS
011612  000002                V2:     2
011614  000004                V4:     4
011616  000012                V12:    12
011620  000062                V50D:   50.
011622  000326                V326:   326
                                        ;.4 LSB,NORMAL LIMITS FOR SYSTEM
011624  000050                VNR:    40.
011626  000310                VNP:    200.            ;2 LSB,  INTEGRATION AND FIELD USE ON SPEC TESTS
011630  000144                VSET:   100.            ;1 LSB
011632  000175                VLIN:   125.            ;1.25 LSB
011634  100000                        BIT15
                                        
011636  052777  000100  167300  AGATST: BIS     #100,@$TKS
011644  000137                        JMP     @(PC)+
011646  001644                AGTST:  BEGIN
```

```
 1358                                   .SBTTL  END OF PASS ROUTINE
  (1)
  (2)                                   ;;**********************************************************************
  (1)                                   ;*INCREMENT THE PASS NUMBER ($PASS)
  (1)                                   ;*IF THERES A MONITOR GO TO IT
  (1)                                   ;*IF THERE ISN'T JUMP TO AGATST
  (1)
  (1)  011650                           $EOP:
  (2)  011650  000240                           NOP
  (1)  011652  005037  001102                   CLR     $TSTNM          ;;ZERO THE TEST NUMBER
  (1)  011656  005037  001160                   CLR     $TIMES          ;;ZERO THE NUMBER OF ITERATIONS
  (1)  011662  005237  001202                   INC     $PASS           ;;INCREMENT THE PASS NUMBER
  (1)  011666  042737  100000  001202           BIC     #100000,$PASS   ;;DON'T ALLOW A NEG. NUMBER
  (1)  011674  005327                           DEC     (PC)+           ;;LOOP?
  (1)  011676  000001                   $EOPCT: .WORD   1
  (1)  011700  003035                           BGT     $DOAGN          ;;YES
  (1)  011702  012737                           MOV     (PC)+,@(PC)+    ;;RESTORE COUNTER
  (1)  011704  000001                   $ENDCT: .WORD   1
  (1)  011706  011676                           $EOPCT
  (3)  011710  104401  011716                   TYPE    ,65$            ;;TYPE ASCIZ STRING
  (3)  011714  000414                           BR      64$             ;;GET OVER THE ASCIZ
  (3)                                   ;;65$:  .ASCIZ  <15><12>/ENDPASS  GOOD UNITS  /
  (3)  011746                           64$:
  (3)  011746  013746  001436                   MOV     GUNITS,-(SP)    ;;SAVE GUNITS FOR TYPEOUT
  (3)  011752  104405                           TYPBN                   ;;GO TYPE--BINARY ASCII
  (1)  011754  013700  000042           $GET42: MOV     @#42,R0         ;;GET MONITOR ADDRESS
  (1)  011760  001405                           BEQ     $DOAGN          ;;BRANCH IF NO MONITOR
  (1)  011762  000005                           RESET                   ;;CLEAR THE WORLD
  (1)  011764  004710                   $ENDAD: JSR     PC,(R0)         ;;GO TO MONITOR
  (1)  011766  000240                           NOP                     ;;SAVE ROOM
  (1)  011770  000240                           NOP                     ;;FOR
  (1)  011772  000240                           NOP                     ;;ACT11
  (1)  011774                           $DOAGN:
  (1)  011774  000137                           JMP     @(PC)+          ;;RETURN
  (1)  011776  011636                   $RTNAD: .WORD   AGATST
  (1)  012000     377     377     000   $ENULL: .BYTE   -1,-1,0          ;;NULL CHARACTER STRING
  (1)          012004                           .EVEN
```

```
                                                .SBTTL          ASCII MESSAGES
1360
1361  012004  005015  047516  051511  NOIMSG: .ASCIZ  <15><12>/NOISE TEST/<15><12>
      012012  020105  042524  052123
      012020  005015     000
1362  012023     015  051412  052105  SETMSG: .ASCIZ  <15><12>/SETTLING TEST/<15><12>
      012030  046124  047111  020107
      012036  042524  052123  005015
      012044     000
1363  012045     055     000          MINUS:  .BYTE   55,0
1364  012047     077     000          QUEST:  .BYTE   77,0
1365  012051     136     101     040  AMSG:   .BYTE   136,101,40,40,0
      012054     040     000
1366  012056     136     103     040  CMSG:   .BYTE   136,103,40,40,0
      012061     040     000
1367  012063     136     107     015  GMSG:   .BYTE   136,107,15,12,123,127,122,105,107,72,0
      012066     012     123     127
      012071     122     105     107
      012074     072     000
1368  012076  046040  041123  005015  LSBMSG: .ASCIZ  / LSB/<15><12>
      012104     000
1369  012105     055  020055     000  DASH:   .ASCIZ  /-- /
1370  012111     123  040524  042524  STATE:  .ASCIZ  /STATE-- WIDTH/<15><12>
      012116  026455  053440  042111
      012124  044124  005015     000
1371  012131     103  000110          CH:     .ASCIZ  /CH/
1372  012134  020040  020040     000  SPACE:  .ASCIZ  /    /
1373  012141     040  051514  020102  LSB:    .ASCIZ  / LSB ON CH/
      012146  047117  041440  000110
1374  012154  051440  052105  046124  SETCH:  .ASCIZ  / SETTLING FROM CH/
      012162  047111  020107  051106
      012170  046517  041440  000110
1375  012176  040440  020124     000  ATMSG:  .ASCIZ  / AT /
1376  012203     116  044517  042523  NOI:    .ASCIZ  /NOISE: /
      012210  020072     000
1377  012213     040  047117  041440  CHAN:   .ASCIZ  / ON CHANNEL /
      012220  040510  047116  046105
      012226  000040
1378  012230  020040  020040  047504  DONE:   .ASCIZ  /    DONE/<15><12>
      012236  042516  005015     000
1379  012243     057     000          SLASH:  .ASCIZ  #/#
1380  012245     040  020040  047440  OKMSG:  .ASCIZ  /    OK/<15><12>
      012252  006513  000012
1381  012256  005015  054524  042520  CCHAN:  .ASCIZ  <15><12>/TYPE CHANNEL & CR: /
      012264  041440  040510  047116
      012272  046105  023040  041440
      012300  035122  000040
1382  012304  005015  054524  042520  SEL:    .ASCIZ  <15><12>/TYPE 'O'' FOR OFFSET, 'G'' FOR GAIN & CR: /
      012312  021040  021117  043040
      012320  051117  047440  043106
      012326  042523  026124  021040
      012334  021107  043040  051117
      012342  043440  044501  020116
      012350  020046  051103  020072
      012356     000
```

```
 1384  012357     015  040412  045104  XADJ:   .ASCII  <15><12>/ADJUST R15/
       012364  051525  020124  030522
       012372     065
 1385  012373     040  047506  020122  MOLSB:  .ASCIZ  / FOR 0.00 LSB ERROR/
       012400  027060  030060  046040
       012406  041123  042440  051122
       012414  051117     000
 1386  012417     015  044412  050116  IGND:   .ASCII  <15><12>/INPUT A GROUND ON THE CHANNEL/
       012424  052125  040440  043440
       012432  047522  047125  020104
       012440  047117  052040  042510
       012446  041440  040510  047116
       012454  046105
 1387  012456  005015  054524  042520  CRWR:   .ASCIZ  <15><12>/TYPE CR WHEN READY/<15><12>
       012464  041440  020122  044127
       012472  047105  051040  040505
       012500  054504  005015     000
 1388  012505     015  044412  050116  IVOLT:  .ASCIZ  <15><12>/INPUT +5.115 VOLTS ON THE CHANNEL/
       012512  052125  025440  027065
       012520  030461  020065  047526
       012526  052114  020123  047117
       012534  052040  042510  041440
       012542  040510  047116  046105
       012550     000
 1389  012551     015  040412  045104  YADJ:   .ASCIZ  <15><12>/ADJUST R3/
       012556  051525  020124  031522
       012564     000
 1390  012565     053     000          POSITV: .ASCIZ  /+/
 1391  012567     040  025052  051105  ERMSG:  .ASCIZ  / **ERROR**/<15><12>
       012574  047522  025122  006452
       012602  000012
 1392  012604  051440  044513  050120  SKPMSG: .ASCIZ  / SKIPPED STATE(S)/
       012612  042105  051440  040524
       012620  042524  051450  000051
 1393  012626  047040  051101  047522  NARMSG: .ASCIZ  # NARROW (< 1/2 LSB) STATE(S)#<15><12>
       012634  020127  036050  030440
       012642  031057  046040  041123
       012650  020051  052123  052101
       012656  024105  024523  005015
       012664     000
 1394  012665     040  044527  042504  WIDMSG: .ASCIZ  # WIDE (> 1 1/2 LSB) STATE(S)#<15><12>
       012672  024040  020076  020061
       012700  027461  020062  051514
       012706  024502  051440  040524
       012714  042524  051450  006451
       012722  000012
 1395  012724  051440  040524  042524  OUTMSG: .ASCIZ  / STATE(S) WIDER THAN 2 LSB/
       012732  051450  020051  044527
       012740  042504  020122  044124
       012746  047101  031040  046040
       012754  041123     000
```

```
 1397  012757  000040  052123  052101  HAFMSG: .ASCIZ  # STATE-WIDTH(S) OUTSIDE + OR - 1/2 LSB#
       012764  026505  044527  052104
       012772  024110  024523  047440
       013000  052125  044523  042504
       013006  025440  047440  020122
       013014  020055  027461  020062
       013022  051514  000102
 1398  013026  046040  041123  051040  MESR:   .ASCIZ  / LSB RMS, /
       013034  051515  020054  000000
 1399  013041  000040  051514  020102  MESP:   .ASCIZ  / LSB PEAK AT /
       013046  042520  045501  040440
       013054  020124  000000
 1400  013057  000015  042412  042116  MEND:   .ASCII  <15><12>/END OF LOGIC TESTS/
       013064  047440  020106  047514
       013072  044507  020103  042524
       013100  052123  000123
 1401  013103  000040  047117  040440  ONAD:   .ASCIZ  / ON ADV11 AT /
       013110  053104  030461  040440
       013116  020124  000000
 1402  013121  000040  042101  030526  MSG50:  .ASCIZ  / ADV11'S FOUND/<15><12>
       013126  023461  020123  047506
       013134  047125  006504  000012
 1403  013142  005012  025412  027461  MSG18:  .ASCII  <12><12><12>#+1/2 LSB#<15><12><12><12><12><12><12><12><12><12><12><12><1
       013150  020062  051514  006502
       013156  005012  005012  005012
       013164  005012  005012  005012
 1404  013172  030455  031057  051514          .ASCIZ  \-1/2LSB\
       013200  000102
 1405
 1406                                          .EVEN
 1407  013202  044504  043106  051105  MSG20:  .ASCIZ  /DIFFERENTIAL LINEARITY:/<15><12>
       013210  047105  044524  046101
       013216  046040  047111  040505
       013224  044522  054524  006472
       013232  000012
```

```
 1409  013234  020040  020040  020040  MSG16:  .ASCII  /                    STATE-WIDTH DISTRIBUTION/<15><12><12><12>
       013242  020040  020040  020040
       013250  020040  020040  020040
       013256  020040  052123  052101
       013264  026505  044527  052104
       013272  020110  044504  052123
       013300  044522  052502  044524
       013306  047117  005015  005012
 1410  013314  020040  020043  043117          .ASCII  /  # OF STATES/<12><12><12><12><12><12><12><12><12><12><12><12><12><12><12><
       013322  051440  040524  042524
       013330  005123  005012  005012
       013336  005012  005012  005012
       013344  005012  005012  005012
       013352  005012
 1411  013354  020040  020040  020040          .ASCII  /                                                STATE WIDTH (LSB)/<15>
       013362  020040  020040  020040
       013370  020040  020040  020040
       013376  020040  020040  020040
       013404  020040  020040  020040
       013412  020040  020040  020040
       013420  020040  020040  020040
       013426  020040  020040  020040
       013434  051440  040524  042524
       013442  053440  042111  044124
       013450  024040  051514  024502
       013456  005015
 1412  013460  030040  020040  020040          .ASCIZ  # 0            1/2            1            1 1/2            2#
       013466  020040  020040  020040
       013474  020040  020040  027461
       013502  020062  020040  020040
       013510  020040  020040  020040
       013516  020040  020061  020040
       013524  020040  020040  020040
       013532  020040  030440  030440
       013540  031057  020040  020040
       013546  020040  020040  020040
       013554  020040  031040     000
 1413  013561     015  052012  050131  MSG71:  .ASCIZ  <15><12>/TYPE LETTER & CR FOR TEST: /
       013566  020105  042514  052124
       013574  051105  023040  041440
       013602  020122  047506  020122
       013610  042524  052123  020072
       013616     000
 1414  013617     122  046105  052101  MSG21:  .ASCIZ  /RELATIVE ACCURACY:/<15><12>
       013624  053111  020105  041501
       013632  052503  040522  054503
       013640  006472  000012
 1415  013644  046040  041123  046440  LINEA:  .ASCIZ  / LSB MAXIMUM AT /
       013652  054101  046511  046525
       013660  040440  020124     000
 1416  013665     015  050012  044522  HEAD5:  .ASCII  <15><12>/PRINT VALUES--/
       013672  052116  053040  046101
       013700  042525  026523     055
```

```
1418  013705  040     042523  020124  ASKCH:  .ASCIZ  / SET CHANNEL IN SWR LOW BYTE/<15><12>
      013712  044103  047101  042516
      013720  020114  047111  051440
      013726  051127  046040  053517
      013734  041040  052131  006505
      013742  000012
1419  013744  055033  000             C0:     .ASCIZ  <33><132>
1420  013747  033     015462  000110  C2:     .ASCIZ  <33><62><33><110>       ;CLEAR GRAPH MODE AND HOME
1421  013754  000112                  C3:     .ASCIZ  <112>
1422  013756  005015  043117  051506  MOFSET: .ASCIZ  <15><12>/OFFSET =/
      013764  052105  036440  000
1423  013771  040     051514  020102  MLSB:   .ASCIZ  / LSB /
      013776  000
1424  013777  040     052101  000040  MAT:    .ASCIZ  / AT /
1425  014004  005015  042440  052116  METST:  .ASCIZ  <15><12>/ ENTERING TEST /
      014012  051105  047111  020107
      014020  042524  052123  000040
1426  014026  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
      014031  061     111     062
      014034  114     041     060
      014037  045     063     051
      014042  066     055     071
      014045  061     074     110
      014050  041     040     112
      014053  000
1427  014054  033     061     101     BUFF2:  .BYTE   33,61,101,47,111,61,104,50,65,44,62,110,40,40,102,0
      014057  047     111     061
      014062  104     050     065
      014065  044     062     110
      014070  040     040     102
      014073  000
1428  014074  033     110     033     VTINIT: .BYTE   33,110,33,112,33,61,101,40,33,62,0      ;HOME & ERASE SCREEN & CLEAR GRA
      014077  112     033     061
      014102  101     040     033
      014105  062     000
```

```
1430  014107  015     005012  042115  HEAD1:  .ASCII  <15><12><12>/MD-11-DVADA-B    ADV11 DIAGNOSTIC/<15><12>
      014114  030455  026461  053104
      014122  042101  026501  020102
      014130  020040  040440  053104
      014136  030461  042040  040511
      014144  047107  051517  044524
      014152  006503  012
1431  014155  012     035101  040440          .ASCII  <12>/A: AUTO TEST/
      014162  052125  020117  042524
      014170  052123
1432  014172  005015  035103  041440          .ASCII  <15><12>/C: CALIBRATION/
      014200  046101  041111  040522
      014206  044524  047117
1433  014212  005015  035120  050040          .ASCII  <15><12>/P: PRINT VALUES/
      014220  044522  052116  053040
      014226  046101  042525  123
1434  014233  015     046012  020072          .ASCII  <15><12>/L: LOGIC/
      014240  047514  044507  103
1435  014245  015     053412  020072          .ASCIZ  <15><12>/W: WRAPAROUND/<15><12>
      014252  051127  050101  051101
      014260  052517  042116  005015
      014266  000
1436  014267  123     040524  052524  EM1:    .ASCIZ  /STATUS REG. ERROR/
      014274  020123  042522  027107
      014302  042440  051122  051117
      014310  000
1437  014311  106     044501  042514  EM2:    .ASCIZ  /FAILED TO INTERRUPT/
      014316  020104  047524  044440
      014324  052116  051105  052522
      014332  052120  000
1438  014335  125     042516  050130  EM3:    .ASCIZ  /UNEXPECTED INTERRUPT/
      014342  041505  042524  020104
      014350  047111  042524  051122
      014356  050125  000124
1439  014362  051105  047522  020122  EM4:    .ASCIZ  #ERROR ON A/D CHANNEL#
      014370  047117  040440  042057
      014376  041440  040510  047116
      014404  046105  000
```

```
1441  014407  000105  051122  041520  DH1:    .ASCIZ  /ERRPC STREG EXPECTED ACTUAL/
      014414  051440  051124  043505
      014422  042440  050130  041505
      014430  042524  020104  041501
      014436  052524  046101  000000
1442  014443  000105  051122  041520  DH2:    .ASCIZ  /ERRPC  STREG   CHANNEL  NOMINAL  TOLERANCE  ACTUAL/
      014450  020040  052123  042522
      014456  020107  020040  044103
      014464  047101  042516  020114
      014472  047040  046517  047111
      014500  046101  020040  047524
      014506  042514  040522  041516
      014514  020105  040440  052103
      014522  040525  000114
1443  014526  051105  050122  020103  DH3:    .ASCIZ  /ERRPC      STREG    ACTUAL/
      014534  020040  020040  051440
      014542  051124  043505  020040
      014550  020040  041501  052524
      014556  046101  000000
1444  014561  000000                  HUNS:   .BYTE   0
1445  014562  000056                  DECPNT: .BYTE   56
1446  014563  000000                  TENS:   .BYTE   0
1447  014564  000000  000             ONES:   .BYTE   0,0
1448                                  .EVEN
1449
1450  014566  001116  001316  001124  DT1:    $ERRPC, STREG, $GDDAT, $BDDAT,0
      014574  001126  000000
1451  014600  001116  001316  001372  DT2:    $ERRPC,STREG,CHANL,$GDDAT,SPREAD,$BDDAT,0
      014606  001124  001412  001126
      014614  000000
1452  014616  001116  001316  001126  DT3:    $ERRPC,STREG,$BDDAT,0
      014624  000000
1453  014626  000000                  DF1:    0
```

```
1455                                    .SBTTL  TTY INPUT ROUTINE
 (1)
 (2)                                    ;;*****************************************************************
 (1)                                    .ENABL  LSB
 (1)
 (1)                                    .DSABL  LSB
 (1)
 (1)
 (2)                                    ;;*****************************************************************
 (1)                                    ;*THIS ROUTINE WILL INPUT A SINGLE CHARACTER FROM THE TTY
 (1)                                    ;*CALL:
 (1)                                    ;*      RDCHR                   ;;INPUT A SINGLE CHARACTER FROM THE TTY
 (1)                                    ;*      RETURN HERE             ;;CHARACTER IS ON THE STACK
 (1)                                    ;*                              ;;WITH PARITY BIT STRIPPED OFF
 (1)                                    ;
 (1)
 (1)  014630  011646                    $RDCHR: MOV     (SP),-(SP)      ;;PUSH DOWN THE PC
 (1)  014632  016666  000004  000002            MOV     4(SP),2(SP)     ;;SAVE THE PS
 (1)  014640  105777  164300            1$:     TSTB    @$TKS           ;;WAIT FOR
 (1)  014644  100375                            BPL     1$              ;;A CHARACTER
 (1)  014646  117766  164274  000004            MOVB    @$TKB,4(SP)     ;;READ THE TTY
 (1)  014654  042766  177600  000004            BIC     #^C<177>,4(SP)  ;;GET RID OF JUNK IF ANY
 (1)  014662  026627  000004  000023            CMP     4(SP),#23       ;;IS IT A CONTROL-S?
 (1)  014670  001013                            BNE     3$              ;;BRANCH IF NO
 (1)  014672  105777  164246            2$:     TSTB    @$TKS           ;;WAIT FOR A CHARACTER
 (1)  014676  100375                            BPL     2$              ;;LOOP UNTIL ITS THERE
 (1)  014700  117746  164242                    MOVB    @$TKB,-(SP)     ;;GET CHARACTER
 (1)  014704  042716  177600                    BIC     #^C177,(SP)     ;;MAKE IT 7-BIT ASCII
 (1)  014710  022627  000021                    CMP     (SP)+,#21       ;;IS IT A CONTROL-Q?
 (1)  014714  001366                            BNE     2$              ;;IF NOT DISCARD IT
 (1)  014716  000750                            BR      1$              ;;YES, RESUME
 (1)  014720  026627  000004  000140    3$:     CMP     4(SP),#140      ;;IS IT UPPER CASE?
 (1)  014726  002407                            BLT     4$              ;;BRANCH IF YES
 (1)  014730  026627  000004  000175            CMP     4(SP),#175      ;;IS IT A SPECIAL CHAR?
 (1)  014736  003003                            BGT     4$              ;;BRANCH IF YES
 (1)  014740  042766  000040  000004            BIC     #40,4(SP)       ;;MAKE IT UPPER CASE
 (1)  014746  000002                    4$:     RTI                     ;;GO BACK TO USER
 (2)                                    ;;*****************************************************************
 (1)                                    ;*THIS ROUTINE WILL INPUT A STRING FROM THE TTY
 (1)                                    ;*CALL:
 (1)                                    ;*      RDLIN                   ;;INPUT A STRING FROM THE TTY
 (1)                                    ;*      RETURN HERE             ;;ADDRESS OF FIRST CHARACTER WILL BE ON THE STACK
 (1)                                    ;*                              ;;TERMINATOR WILL BE A BYTE OF ALL 0'S
 (1)
 (1)  014750  010346                    $RDLIN: MOV     R3,-(SP)        ;;SAVE R3
 (1)  014752  012703  015056            1$:     MOV     #$TTYIN,R3      ;;GET ADDRESS
 (1)  014756  022703  015066            2$:     CMP     #$TTYIN+8.,R3   ;;BUFFER FULL?
 (1)  014762  101405                            BLOS    4$              ;;BR IF YES
 (1)  014764  104406                            RDCHR                   ;;GO READ ONE CHARACTER FROM THE TTY
 (1)  014766  112613                            MOVB    (SP)+,(R3)      ;;GET CHARACTER
 (1)  014770  122713  000177            10$:    CMPB    #177,(R3)       ;;IS IT A RUBOUT
 (1)  014774  001003                            BNE     3$              ;;SKIP IF NOT
 (1)  014776  104401  001170            4$:     TYPE    ,$QUES          ;;TYPE A '?'
 (1)  015002  000763                            BR      1$              ;;CLEAR THE BUFFER AND LOOP
 (1)  015004  111337  015054            3$:     MOVB    (R3),9$         ;;ECHO THE CHARACTER
 (1)  015010  104401  015054                    TYPE    ,9$
```

```
(1)  015014  122723  000015              CMPB    #15,(R3)+       ;;CHECK FOR RETURN
(1)  015020  001356                      BNE     2$              ;;LOOP IF NOT RETURN
(1)  015022  105063  177777              CLRB    -1(R3)          ;;CLEAR RETURN (THE 15)
(1)  015026  104401  001172              TYPE    ,$LF            ;;TYPE A LINE FEED
(1)  015032  012603                      MOV     (SP)+,R3        ;;RESTORE R3
(1)  015034  011646                      MOV     (SP),-(SP)      ;;ADJUST THE STACK AND PUT ADDRESS OF THE
(1)  015036  016666  000004  000002      MOV     4(SP),2(SP)     ;;      FIRST ASCII CHARACTER ON IT
(1)  015044  012766  015056  000004      MOV     #$TTYIN,4(SP)
(1)  015052  000002                      RTI                     ;;RETURN
(1)  015054     000              9$:     .BYTE   0               ;;STORAGE FOR ASCII CHAR. TO TYPE
(1)  015055     000                      .BYTE   0               ;;TERMINATOR
(1)  015056  000010              $TTYIN: .BLKB   8.              ;;RESERVE 8 BYTES FOR TTY INPUT
(1)  015066  052536  005015  000 $CNTLU: .ASCIZ  /^U/<15><12>    ;;CONTROL 'U'
(1)  015073     136  006507  000012 $CNTLG: .ASCIZ  /^G/<15><12>    ;;CONTROL 'G'
(1)  015100  005015  053523  020122 $MSWR:  .ASCIZ  <15><12>/SWR = /
(1)  015106  020075     000
(1)  015111     040  047040  053505 $MNEW:  .ASCIZ  /  NEW = /
(1)  015116  036440  000040
```

```
1457                                    .SBTTL  READ AN OCTAL NUMBER FROM THE TTY
  (1)
  (2)                                   ;;**********************************************************************
  (1)                                   ;*THIS ROUTINE WILL READ AN OCTAL (ASCII) NUMBER FROM THE TTY AND
  (1)                                   ;*CHANGE IT TO BINARY.
  (1)                                   ;*CALL:
  (1)                                   ;*      RDOCT                   ;;READ AN OCTAL NUMBER
  (1)                                   ;*      RETURN HERE             ;;LOW ORDER BITS ARE ON TOP OF THE STACK
  (1)                                   ;*                              ;;HIGH ORDER BITS ARE IN $HIOCT
  (1)
  (1)  015122  011646                   $RDOCT: MOV     (SP),-(SP)      ;;PROVIDE SPACE FOR THE
  (1)  015124  016666  000004  000002           MOV     4(SP),2(SP)     ;;INPUT NUMBER
  (3)  015132  010046                           MOV     R0,-(SP)        ;;PUSH R0 ON STACK
  (3)  015134  010146                           MOV     R1,-(SP)        ;;PUSH R1 ON STACK
  (3)  015136  010246                           MOV     R2,-(SP)        ;;PUSH R2 ON STACK
  (1)  015140  104407                   1$:     RDLIN                   ;;READ AN ASCIZ LINE
  (1)  015142  012600                           MOV     (SP)+,R0        ;;GET ADDRESS OF 1ST CHARACTER
  (1)  015144  005001                           CLR     R1              ;;CLEAR DATA WORD
  (1)  015146  005002                           CLR     R2
  (1)  015150  112046                   2$:     MOVB    (R0)+,-(SP)     ;;PICKUP THIS CHARACTER
  (1)  015152  001412                           BEQ     3$              ;;IF ZERO GET OUT
  (1)  015154  006301                           ASL     R1              ;;*2
  (1)  015156  006102                           ROL     R2
  (1)  015160  006301                           ASL     R1              ;;*4
  (1)  015162  006102                           ROL     R2
  (1)  015164  006301                           ASL     R1              ;;*8
  (1)  015166  006102                           ROL     R2
  (1)  015170  042716  177770                   BIC     #^C7,(SP)       ;;STRIP THE ASCII JUNK
  (1)  015174  062601                           ADD     (SP)+,R1        ;;ADD IN THIS DIGIT
  (1)  015176  000764                           BR      2$              ;;LOOP
  (1)  015200  005726                   3$:     TST     (SP)+           ;;CLEAN TERMINATOR FROM STACK
  (1)  015202  010166  000012                   MOV     R1,12(SP)       ;;SAVE THE RESULT
  (1)  015206  010237  015222                   MOV     R2,$HIOCT
  (3)  015212  012602                           MOV     (SP)+,R2        ;;POP STACK INTO R2
  (3)  015214  012601                           MOV     (SP)+,R1        ;;POP STACK INTO R1
  (3)  015216  012600                           MOV     (SP)+,R0        ;;POP STACK INTO R0
  (1)  015220  000002                           RTI                     ;;RETURN
  (1)  015222  000000                   $HIOCT: .WORD   0               ;;HIGH ORDER BITS GO HERE
```

```
1459                                    .SBTTL  SCOPE HANDLER ROUTINE
 (1)
 (2)                                    ;;**********************************************************************
 (1)                                    ;*THIS ROUTINE CONTROLS THE LOOPING OF SUBTESTS. IT WILL INCREMENT
 (1)                                    ;*AND LOAD THE TEST NUMBER($TSTNM) INTO THE DISPLAY REG.(DISPLAY<7:0>)
 (1)                                    ;*AND LOAD THE ERROR FLAG ($ERFLG) INTO DISPLAY<15:08>
 (1)                                    ;*THE SWITCH OPTIONS PROVIDED BY THIS ROUTINE ARE:
 (1)                                    ;*SW14=1        LOOP ON TEST
 (1)                                    ;*SW11=1        INHIBIT ITERATIONS
 (1)                                    ;*SW09=1        LOOP ON ERROR
 (1)                                    ;*SW08=1        LOOP ON TEST IN SWR<7:0>
 (1)                                    ;*CALL
 (1)                                    ;*      SCOPE           ;;SCOPE=IOT
 (1)
 (1)  015224                            $SCOPE:
 (1)  015224  032777  040000  163706    1$:     BIT     #BIT14,@SWR     ;;LOOP ON PRESENT TEST?
 (1)  015232  001114                            BNE     $OVER           ;;YES IF SW14=1
 (1)                                    ;#####START OF CODE FOR THE XOR TESTER#####
 (1)  015234  000416                    $XTSTR: BR      6$              ;;IF RUNNING ON THE "XOR" TESTER CHANGE
 (1)                                                                    ;;THIS INSTRUCTION TO A "NOP" (NOP=240)
 (1)  015236  013746  000004                    MOV     @#ERRVEC,-(SP)  ;;SAVE THE CONTENTS OF THE ERROR VECTOR
 (1)  015242  012737  015262  000004            MOV     #5$,@#ERRVEC    ;;SET FOR TIMEOUT
 (1)  015250  005737  177060                    TST     @#177060        ;;TIME OUT ON XOR?
 (1)  015254  012637  000004                    MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
 (1)  015260  000463                            BR      $SVLAD          ;;GO TO THE NEXT TEST
 (1)  015262  022626                    5$:     CMP     (SP)+,(SP)+     ;;CLEAR THE STACK AFTER A TIME OUT
 (1)  015264  012637  000004                    MOV     (SP)+,@#ERRVEC  ;;RESTORE THE ERROR VECTOR
 (1)  015270  000423                            BR      7$              ;;LOOP ON THE PRESENT TEST
 (1)  015272                            6$:;#####END OF CODE FOR THE XOR TESTER#####
 (1)  015272  032777  000400  163640            BIT     #BIT08,@SWR     ;;LOOP ON SPEC. TEST?
 (1)  015300  001404                            BEQ     2$              ;;BR IF NO
 (1)  015302  127737  163632  001102            CMPB    @SWR,$TSTNM     ;;ON THE RIGHT TEST?    SWR<7:0>
 (1)  015310  001465                            BEQ     $OVER           ;;BR IF YES
 (1)  015312  105737  001103            2$:     TSTB    $ERFLG          ;;HAS AN ERROR OCCURRED?
 (1)  015316  001421                            BEQ     3$              ;;BR IF NO
 (1)  015320  123737  001115  001103            CMPB    $ERMAX,$ERFLG   ;;MAX. ERRORS FOR THIS TEST OCCURRED?
 (1)  015326  101015                            BHI     3$              ;;BR IF NO
 (1)  015330  032777  001000  163602            BIT     #BIT09,@SWR     ;;LOOP ON ERROR?
 (1)  015336  001404                            BEQ     4$              ;;BR IF NO
 (1)  015340  013737  001110  001106    7$:     MOV     $LPERR,$LPADR   ;;SET LOOP ADDRESS TO LAST SCOPE
 (1)  015346  000446                            BR      $OVER
 (1)  015350  105037  001103            4$:     CLRB    $ERFLG          ;;ZERO THE ERROR FLAG
 (1)  015354  005037  001160                    CLR     $TIMES          ;;CLEAR THE NUMBER OF ITERATIONS TO MAKE
 (1)  015360  000415                            BR      1$              ;;ESCAPE TO THE NEXT TEST
 (1)  015362  032777  004000  163550    3$:     BIT     #BIT11,@SWR     ;;INHIBIT ITERATIONS?
 (1)  015370  001011                            BNE     1$              ;;BR IF YES
 (1)  015372  005737  001202                    TST     $PASS           ;;IF FIRST PASS OF PROGRAM
 (1)  015376  001406                            BEQ     1$              ;;      INHIBIT ITERATIONS
 (1)  015400  005237  001104                    INC     $ICNT           ;;INCREMENT ITERATION COUNT
 (1)  015404  023737  001160  001104            CMP     $TIMES,$ICNT    ;;CHECK THE NUMBER OF ITERATIONS MADE
 (1)  015412  002024                            BGE     $OVER           ;;BR IF MORE ITERATION REQUIRED
 (1)  015414  012737  000001  001104    1$:     MOV     #1,$ICNT        ;;REINITIALIZE THE ITERATION COUNTER
 (1)  015422  013737  015500  001160            MOV     $MXCNT,$TIMES   ;;SET NUMBER OF ITERATIONS TO DO
 (1)  015430  105237  001102            $SVLAD: INCB    $TSTNM          ;;COUNT TEST NUMBERS
 (1)  015434  113737  001102  001200            MOVB    $TSTNM,$TESTN   ;;SET TEST NUMBER IN APT MAILBOX
 (1)  015442  011637  001106                    MOV     (SP),$LPADR     ;;SAVE SCOPE LOOP ADDRESS
```

```
(1)  015446  011637  001110            MOV     (SP),$LPERR     ;;SAVE ERROR LOOP ADDRESS
(1)  015452  005037  001162            CLR     $ESCAPE         ;;CLEAR THE ESCAPE FROM ERROR ADDRESS
(1)  015456  112737  000001  001115    MOVB    #1,$ERMAX       ;;ONLY ALLOW ONE(1) ERROR ON NEXT TEST
(1)  015464  013777  001102  163450  $OVER:  MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER
(1)  015472  013716  001106            MOV     $LPADR,(SP)     ;;FUDGE RETURN ADDRESS
(1)  015476  000002                    RTI                     ;;FIXES PS
(1)  015500  003720                  $MXCNT: 2000.             ;;MAX. NUMBER OF ITERATIONS
1460                                   .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)  015502                          $ERROR:
(3)  015502  043737  001440  001436            BIC     TSTBIT,GUNITS
(1)  015510  105237  001103          7$:       INCB    $ERFLG          ;;SET THE ERROR FLAG
(1)  015514  001775                            BEQ     7$              ;;DON'T LET THE FLAG GO TO ZERO
(1)  015516  013777  001102  163416            MOV     $TSTNM,@DISPLAY ;;DISPLAY TEST NUMBER AND ERROR FLAG
(1)  015524  032777  002000  163406            BIT     #BIT10,@SWR     ;;BELL ON ERROR?
(1)  015532  001402                            BEQ     1$              ;;NO - SKIP
(1)  015534  104401  001164                    TYPE    ,$BELL          ;;RING BELL
(1)  015540  005237  001112          1$:       INC     $ERTTL          ;;COUNT THE NUMBER OF ERRORS
(1)  015544  011637  001116                    MOV     (SP),$ERRPC     ;;GET ADDRESS OF ERROR INSTRUCTION
(1)  015550  162737  000002  001116            SUB     #2,$ERRPC
(1)  015556  117737  163334  001114            MOVB    @$ERRPC,$ITEMB  ;;STRIP AND SAVE THE ERROR ITEM CODE
(1)  015564  032777  020000  163346            BIT     #BIT13,@SWR     ;;SKIP TYPEOUT IF SET
(1)  015572  001004                            BNE     20$             ;;SKIP TYPEOUTS
(1)  015574  004737  015704                    JSR     PC,$ERRTYP      ;;GO TO USER ERROR ROUTINE
(1)  015600  104401  001171                    TYPE    ,$CRLF
(1)  015604                          20$:
(1)  015604  122737  000001  001214            CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
(1)  015612  001007                            BNE     2$              ;;NO,SKIP APT ERROR REPORT
(1)  015614  113737  001114  015626            MOVB    $ITEMB,21$      ;;SET ITEM NUMBER AS ERROR NUMBER
(1)  015622  004737  016340                    JSR     PC,$ATY4        ;;REPORT FATAL ERROR TO APT
(1)  015626     000                  21$:      .BYTE   0
(1)  015627     000                            .BYTE   0
(1)  015630  000777                  22$:      BR      22$             ;;APT ERROR LOOP
(1)  015632  005777  163302          2$:       TST     @SWR            ;;HALT ON ERROR
(1)  015636  100001                            BPL     3$              ;;SKIP IF CONTINUE
(1)  015640  000000                            HALT                    ;;HALT ON ERROR!
(1)  015642  032777  001000  163270  3$:       BIT     #BIT09,@SWR     ;;LOOP ON ERROR SWITCH SET?
(1)  015650  001402                            BEQ     4$              ;;BR IF NO
(1)  015652  013716  001110                    MOV     $LPERR,(SP)     ;;FUDGE RETURN FOR LOOPING
(1)  015656  005737  001162          4$:       TST     $ESCAPE         ;;CHECK FOR AN ESCAPE ADDRESS
(1)  015662  001402                            BEQ     5$              ;;BR IF NONE
(1)  015664  013716  001162                    MOV     $ESCAPE,(SP)    ;;FUDGE RETURN ADDRESS FOR ESCAPE
(1)  015670                          5$:
(1)  015670  022737  011764  000042            CMP     #$ENDAD,@#42    ;;ACT-11 AUTO-ACCEPT?
```

```
(1)  015676  001001                    BNE     6$              ;;BRANCH IF NO
(1)  015700  000000                    HALT                    ;;YES
(1)  015702                         6$:
(1)  015702  000002                    RTI                     ;;RETURN
1461                                .SBTTL  ERROR MESSAGE TYPEOUT ROUTINE
(1)
(2)                                 ;;**********************************************************************
(1)                                 ;*THIS ROUTINE USES THE "ITEM CONTROL BYTE" ($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)  015704                         $ERRTYP:
(1)  015704  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  015710  010046                    MOV     R0,-(SP)        ;;SAVE R0
(1)  015712  005000                    CLR     R0              ;;PICKUP THE ITEM INDEX
(1)  015714  153700  001114            BISB    @#$ITEMB,R0
(1)  015720  001004                    BNE     1$              ;;IF ITEM NUMBER IS ZERO, JUST
(1)                                                            ;;TYPE THE PC OF THE ERROR
(2)  015722  013746  001116            MOV     $ERRPC,-(SP)    ;;SAVE $ERRPC FOR TYPEOUT
(2)                                                            ;;ERROR ADDRESS
(2)  015726  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
(1)  015730  000426                    BR      6$              ;;GET OUT
(1)  015732  005300                 1$:DEC     R0              ;;ADJUST THE INDEX SO THAT IT WILL
(1)  015734  006300                    ASL     R0              ;;      WORK FOR THE ERROR TABLE
(1)  015736  006300                    ASL     R0
(1)  015740  006300                    ASL     R0
(1)  015742  062700  001256            ADD     #$ERRTB,R0      ;;FORM TABLE POINTER
(1)  015746  012037  015756            MOV     (R0)+,2$        ;;PICKUP "ERROR MESSAGE" POINTER
(1)  015752  001404                    BEQ     3$              ;;SKIP TYPEOUT IF NO POINTER
(1)  015754  104401                    TYPE                    ;;TYPE THE "ERROR MESSAGE"
(1)  015756  000000                 2$:.WORD   0               ;;"ERROR MESSAGE" POINTER GOES HERE
(1)  015760  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  015764  012037  015774         3$:MOV     (R0)+,4$        ;;PICKUP "DATA HEADER" POINTER
(1)  015770  001404                    BEQ     5$              ;;SKIP TYPEOUT IF 0
(1)  015772  104401                    TYPE                    ;;TYPE THE "DATA HEADER"
(1)  015774  000000                 4$:.WORD   0               ;;"DATA HEADER" POINTER GOES HERE
(1)  015776  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  016002  011000                 5$:MOV     (R0),R0         ;;PICKUP "DATA TABLE" POINTER
(1)  016004  001004                    BNE     7$              ;;GO TYPE THE DATA
(1)  016006  012600                 6$:MOV     (SP)+,R0        ;;RESTORE R0
(1)  016010  104401  001171            TYPE    ,$CRLF          ;;"CARRIAGE RETURN" & "LINE FEED"
(1)  016014  000207                    RTS     PC              ;;RETURN
(1)  016016                         7$:
(2)  016016  013046                    MOV     @(R0)+,-(SP)    ;;SAVE @(R0)+ FOR TYPEOUT
(2)  016020  104402                    TYPOC                   ;;GO TYPE--OCTAL ASCII(ALL DIGITS)
(1)  016022  005710                    TST     (R0)            ;;IS THERE ANOTHER NUMBER?
(1)  016024  001770                    BEQ     6$              ;;BR IF NO
(1)  016026  104401  016034            TYPE    ,8$             ;;TYPE TWO(2) SPACES
(1)  016032  000771                    BR      7$              ;;LOOP
(1)  016034  020040      000       8$:.ASCIZ  /  /            ;;TWO(2) SPACES
(1)          016040                    .EVEN
```

```
1463                                    .SBTTL  TYPE ROUTINE
 (1)
 (2)                                    ;;*********************************************************************
 (1)                                    ;*ROUTINE TO TYPE ASCIZ MESSAGE. MESSAGE MUST TERMINATE WITH A 0 BYTE.
 (1)                                    ;*THE ROUTINE WILL INSERT A NUMBER OF NULL CHARACTERS AFTER A LINE FEED.
 (1)                                    ;*NOTE1:        $NULL CONTAINS THE CHARACTER TO BE USED AS THE FILLER CHARACTER.
 (1)                                    ;*NOTE2:        $FILLS CONTAINS THE NUMBER OF FILLER CHARACTERS REQUIRED.
 (1)                                    ;*NOTE3:        $FILLC CONTAINS THE CHARACTER TO FILL AFTER.
 (1)                                    ;*
 (1)                                    ;*CALL:
 (1)                                    ;*1) USING A TRAP INSTRUCTION
 (1)                                    ;*      TYPE    ,MESADR         ;;MESADR IS FIRST ADDRESS OF AN ASCIZ STRING
 (1)                                    ;*OR
 (1)                                    ;*      TYPE
 (1)                                    ;*      MESADR
 (1)                                    ;*
 (1)
 (1)  016040  105737  001157            $TYPE:  TSTB    $TPFLG          ;;IS THERE A TERMINAL?
 (1)  016044  100002                            BPL     1$              ;;BR IF YES
 (1)  016046  000000                            HALT                    ;;HALT HERE IF NO TERMINAL
 (1)  016050  000430                            BR      3$              ;;LEAVE
 (1)  016052  010046                    1$:     MOV     R0,-(SP)        ;;SAVE R0
 (1)  016054  017600  000002                    MOV     @2(SP),R0       ;;GET ADDRESS OF ASCIZ STRING
 (1)  016060  122737  000001  001214            CMPB    #APTENV,$ENV    ;;RUNNING IN APT MODE
 (1)  016066  001011                            BNE     62$             ;;NO,GO CHECK FOR APT CONSOLE
 (1)  016070  132737  000100  001215            BITB    #APTSPOOL,$ENVM ;;SPOOL MESSAGE TO APT
 (1)  016076  001405                            BEQ     62$             ;;NO,GO CHECK FOR CONSOLE
 (1)  016100  010037  016110                    MOV     R0,61$          ;;SETUP MESSAGE ADDRESS FOR APT
 (1)  016104  004737  016330                    JSR     PC,$ATY3        ;;SPOOL MESSAGE TO APT
 (1)  016110  000000                    61$:    .WORD   0               ;;MESSAGE ADDRESS
 (1)  016112  132737  000040  001215    62$:    BITB    #APTCSUP,$ENVM  ;;APT CONSOLE SUPPRESSED
 (1)  016120  001003                            BNE     60$             ;;YES,SKIP TYPE OUT
 (1)  016122  112046                    2$:     MOVB    (R0)+,-(SP)     ;;PUSH CHARACTER TO BE TYPED ONTO STACK
 (1)  016124  001005                            BNE     4$              ;;BR IF IT ISN'T THE TERMINATOR
 (1)  016126  005726                            TST     (SP)+           ;;IF TERMINATOR POP IT OFF THE STACK
 (1)  016130  012600                    60$:    MOV     (SP)+,R0        ;;RESTORE R0
 (1)  016132  062716  000002            3$:     ADD     #2,(SP)         ;;ADJUST RETURN PC
 (1)  016136  000002                            RTI                     ;;RETURN
 (1)  016140  122716  000011            4$:     CMPB    #HT,(SP)        ;;BRANCH IF <HT>
 (1)  016144  001430                            BEQ     8$
 (1)  016146  122716  000200                    CMPB    #CRLF,(SP)      ;;BRANCH IF NOT <CRLF>
 (1)  016152  001006                            BNE     5$
 (1)  016154  005726                            TST     (SP)+           ;;POP  <CR><LF> EQUIV
 (1)  016156  104401                            TYPE                    ;;TYPE A CR AND LF
 (1)  016160  001171                            $CRLF
 (1)  016162  105037  016316                    CLRB    $CHARCNT        ;;CLEAR CHARACTER COUNT
 (1)  016166  000755                            BR      2$              ;;GET NEXT CHARACTER
 (1)  016170  004737  016252            5$:     JSR     PC,$TYPEC       ;;GO TYPE THIS CHARACTER
 (1)  016174  123726  001156            6$:     CMPB    $FILLC,(SP)+    ;;IS IT TIME FOR FILLER CHARS.?
 (1)  016200  001350                            BNE     2$              ;;IF NO GO GET NEXT CHAR.
 (1)  016202  013746  001154                    MOV     $NULL,-(SP)     ;;GET # OF FILLER CHARS. NEEDED
 (1)                                            ;;AND THE NULL CHAR.
 (1)  016206  105366  000001            7$:     DECB    1(SP)           ;;DOES A NULL NEED TO BE TYPED?
 (1)  016212  002770                            BLT     6$              ;;BR IF NO--GO POP THE NULL OFF OF STACK
 (1)  016214  004737  016252                    JSR     PC,$TYPEC       ;;GO TYPE A NULL
 (1)  016220  105337  016316                    DECB    $CHARCNT        ;;DO NOT COUNT AS A COUNT
```

```
(1)  016224  000770                          BR      7$              ;;LOOP
(1)
(1)                                  ;HORIZONTAL TAB PROCESSOR
(1)
(1)  016226  112716  000040          8$:     MOVB    #' ,(SP)        ;;REPLACE TAB WITH SPACE
(1)  016232  004737  016252          9$:     JSR     PC,$TYPEC       ;;TYPE A SPACE
(1)  016236  132737  000007  016316          BITB    #7,$CHARCNT     ;;BRANCH IF NOT AT
(1)  016244  001372                          BNE     9$              ;;TAB STOP
(1)  016246  005726                          TST     (SP)+           ;;POP SPACE OFF STACK
(1)  016250  000724                          BR      2$              ;;GET NEXT CHARACTER
(1)  016252  105777  162672          $TYPEC: TSTB    @$TPS           ;;WAIT UNTIL PRINTER IS READY
(1)  016256  100375                          BPL     $TYPEC
(1)  016260  116677  000002  162664          MOVB    2(SP),@$TPB     ;;LOAD CHAR TO BE TYPED INTO DATA REG.
(1)  016266  122766  000015  000002          CMPB    #CR,2(SP)       ;;IS CHARACTER A CARRIAGE RETURN?
(1)  016274  001003                          BNE     1$              ;;BRANCH IF NO
(1)  016276  105037  016316                  CLRB    $CHARCNT        ;;YES--CLEAR CHARACTER COUNT
(1)  016302  000406                          BR      $TYPEX          ;;EXIT
(1)  016304  122766  000012  000002  1$:     CMPB    #LF,2(SP)       ;;IS CHARACTER A LINE FEED?
(1)  016312  001402                          BEQ     $TYPEX          ;;BRANCH IF YES
(1)  016314  105227                          INCB    (PC)+           ;;COUNT THE CHARACTER
(1)  016316  000000          $CHARCNT:.WORD  0               ;;CHARACTER COUNT STORAGE
(1)  016320  000207          $TYPEX: RTS     PC
(1)
1464                                 .SBTTL  APT COMMUNICATIONS ROUTINE
(1)
(2)                                  ;;**********************************************************************
(1)
(2)                                  ;;**********************************************************************
(1)  016322  112737  000001  016566  $ATY1:  MOVB    #1,$FFLG        ;;TO REPORT FATAL ERROR
(1)  016330  112737  000001  016564  $ATY3:  MOVB    #1,$MFLG        ;;TO TYPE A MESSAGE
(1)  016336  000403                          BR      $ATYC
(1)  016340  112737  000001  016566  $ATY4:  MOVB    #1,$FFLG        ;;TO ONLY REPORT FATAL ERROR
(1)  016346                          $ATYC:
(3)  016346  010046                          MOV     R0,-(SP)        ;;PUSH R0 ON STACK
(3)  016350  010146                          MOV     R1,-(SP)        ;;PUSH R1 ON STACK
(1)  016352  105737  016564                  TSTB    $MFLG           ;;SHOULD TYPE A MESSAGE?
(1)  016356  001450                          BEQ     5$              ;;IF NOT:  BR
(1)  016360  122737  000001  001214          CMPB    #APTENV,$ENV    ;;OPERATING UNDER APT?
(1)  016366  001031                          BNE     3$              ;;IF NOT:  BR
(1)  016370  132737  000100  001215          BITB    #APTSPOOL,$ENVM ;;SHOULD SPOOL MESSAGES?
(1)  016376  001425                          BEQ     3$              ;;IF NOT:  BR
(1)  016400  017600  000004                  MOV     @4(SP),R0       ;;GET MESSAGE ADDR.
(1)  016404  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
(1)  016412  005737  001174          1$:     TST     $MSGTYPE        ;;SEE IF DONE W/ LAST XMISSION?
(1)  016416  001375                          BNE     1$              ;;IF NOT:  WAIT
(1)  016420  010037  001210                  MOV     R0,$MSGAD       ;;PUT ADDR IN MAILBOX
(1)  016424  105720                  2$:     TSTB    (R0)+           ;;FIND END OF MESSAGE
(1)  016426  001376                          BNE     2$
(1)  016430  163700  001210                  SUB     $MSGAD,R0       ;;SUB START OF MESSAGE
(1)  016434  006200                          ASR     R0              ;;GET MESSAGE LNGTH IN WORDS
(1)  016436  010037  001212                  MOV     R0,$MSGLGT      ;;PUT LENGTH IN MAILBOX
(1)  016442  012737  000004  001174          MOV     #4,$MSGTYPE     ;;TELL APT TO TAKE MSG.
(1)  016450  000413                          BR      5$
(1)  016452  017637  000004  016476  3$:     MOV     @4(SP),4$       ;;PUT MSG ADDR IN JSR LINKAGE
(1)  016460  062766  000002  000004          ADD     #2,4(SP)                ;;BUMP RETURN ADDRESS
(3)  016466  013746  177776                  MOV     177776,-(SP)    ;;PUSH 177776 ON STACK
(1)  016472  004737  016040                  JSR     PC,$TYPE        ;;CALL TYPE MACRO
(1)  016476  000000          4$:     .WORD   0
```

```
(1)  016500                              5$:
(1)  016500  105737  016566             10$:    TSTB    $FFLG           ;;SHOULD REPORT FATAL ERROR?
(1)  016504  001416                              BEQ     12$             ;;IF NOT:  BR
(1)  016506  005737  001214                      TST     $ENV            ;;RUNNING UNDER APT?
(1)  016512  001413                              BEQ     12$             ;;IF NOT:  BR
(1)  016514  005737  001174             11$:    TST     $MSGTYPE        ;;FINISHED LAST MESSAGE?
(1)  016520  001375                              BNE     11$             ;;IF NOT:  WAIT
(1)  016522  017637  000004  001176              MOV     @4(SP),$FATAL   ;;GET ERROR #
(1)  016530  062766  000002  000004              ADD     #2,4(SP)                ;;BUMP RETURN ADDR.
(1)  016536  005237  001174                      INC     $MSGTYPE        ;;TELL APT TO TAKE ERROR
(1)  016542  105037  016566             12$:    CLRB    $FFLG           ;;CLEAR FATAL FLAG
(1)  016546  105037  016565                      CLRB    $LFLG           ;;CLEAR LOG FLAG
(1)  016552  105037  016564                      CLRB    $MFLG           ;;CLEAR MESSAGE FLAG
(3)  016556  012601                              MOV     (SP)+,R1        ;;POP STACK INTO R1
(3)  016560  012600                              MOV     (SP)+,R0        ;;POP STACK INTO R0
(1)  016562  000207                              RTS     PC              ;;RETURN
(1)  016564     000             $MFLG:  .BYTE   0               ;;MESSG. FLAG
(1)  016565     000             $LFLG:  .BYTE   0               ;;LOG FLAG
(1)  016566     000             $FFLG:  .BYTE   0               ;;FATAL FLAG
(1)          016570                     .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
                        
016570  017646  000000          $TYPOS: MOV     @(SP),-(SP)     ;;PICKUP THE MODE
016574  116637  000001  017013          MOVB    1(SP),$OFILL    ;;LOAD ZERO FILL SWITCH
016602  112637  017015          MOVB    (SP)+,$OMODE+1  ;;NUMBER OF DIGITS TO TYPE
016606  062716  000002          ADD     #2,(SP)         ;;ADJUST RETURN ADDRESS
016612  000406                  BR      $TYPON
016614  112737  000001  017013  $TYPOC: MOVB    #1,$OFILL       ;;SET THE ZERO FILL SWITCH
016622  112737  000006  017015          MOVB    #6,$OMODE+1     ;;SET FOR SIX(6) DIGITS
016630  112737  000005  017012  $TYPON: MOVB    #5,$OCNT        ;;SET THE ITERATION COUNT
016636  010346                  MOV     R3,-(SP)        ;;SAVE R3
016640  010446                  MOV     R4,-(SP)        ;;SAVE R4
016642  010546                  MOV     R5,-(SP)        ;;SAVE R5
016644  113704  017015          MOVB    $OMODE+1,R4     ;;GET THE NUMBER OF DIGITS TO TYPE
016650  005404                  NEG     R4
016652  062704  000006          ADD     #6,R4           ;;SUBTRACT IT FOR MAX. ALLOWED
016656  110437  017014          MOVB    R4,$OMODE       ;;SAVE IT FOR USE
016662  113704  017013          MOVB    $OFILL,R4       ;;GET THE ZERO FILL SWITCH
016666  016605  000012          MOV     12(SP),R5       ;;PICKUP THE INPUT NUMBER
016672  005003                  CLR     R3              ;;CLEAR THE OUTPUT WORD
016674  006105          1$:     ROL     R5              ;;ROTATE MSB INTO "C"
016676  000404                  BR      3$              ;;GO DO MSB
016700  006105          2$:     ROL     R5              ;;FORM THIS DIGIT
016702  006105                  ROL     R5
016704  006105                  ROL     R5
016706  010503                  MOV     R5,R3
016710  006103          3$:     ROL     R3              ;;GET LSB OF THIS DIGIT
016712  105337  017014          DECB    $OMODE          ;;TYPE THIS DIGIT?
016716  100016                  BPL     7$              ;;BR IF NO
016720  042703  177770          BIC     #177770,R3      ;;GET RID OF JUNK
016724  001002                  BNE     4$              ;;TEST FOR 0
016726  005704                  TST     R4              ;;SUPPRESS THIS 0?
016730  001403                  BEQ     5$              ;;BR IF YES
```

```
(1)  016732  005204                  4$:    INC     R4              ;;DON'T SUPPRESS ANYMORE 0'S
(1)  016734  052703  000060                 BIS     #'0,R3          ;;MAKE THIS DIGIT ASCII
(1)  016740  052703  000040           5$:   BIS     #' ,R3          ;;MAKE ASCII IF NOT ALREADY
(1)  016744  110337  017010                 MOVB    R3,8$           ;;SAVE FOR TYPING
(1)  016750  104401  017010                 TYPE    ,8$             ;;GO TYPE THIS DIGIT
(1)  016754  105337  017012           7$:   DECB    $OCNT           ;;COUNT BY 1
(1)  016760  003347                        BGT     2$              ;;BR IF MORE TO DO
(1)  016762  002402                        BLT     6$              ;;BR IF DONE
(1)  016764  005204                        INC     R4              ;;INSURE LAST DIGIT ISN'T A BLANK
(1)  016766  000744                        BR      2$              ;;GO DO THE LAST DIGIT
(1)  016770  012605                  6$:   MOV     (SP)+,R5        ;;RESTORE R5
(1)  016772  012604                        MOV     (SP)+,R4        ;;RESTORE R4
(1)  016774  012603                        MOV     (SP)+,R3        ;;RESTORE R3
(1)  016776  016666  000002  000004        MOV     2(SP),4(SP)     ;;SET THE STACK FOR RETURNING
(1)  017004  012616                        MOV     (SP)+,(SP)
(1)  017006  000002                        RTI                     ;;RETURN
(1)  017010     000                  8$:   .BYTE   0               ;;STORAGE FOR ASCII DIGIT
(1)  017011     000                        .BYTE   0               ;;TERMINATOR FOR TYPE ROUTINE
(1)  017012     000                  $OCNT:.BYTE   0               ;;OCTAL DIGIT COUNTER
(1)  017013     000                  $OFILL:.BYTE  0               ;;ZERO FILL SWITCH
(1)  017014  000000                  $OMODE:.WORD  0               ;;NUMBER OF DIGITS TO TYPE
```

```
1468                                    .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)  017016  010146                    $TYPBN: MOV     R1,-(SP)        ;;SAVE R1 ON THE STACK
 (1)  017020  016601  000006                    MOV     6(SP),R1        ;;GET THE INPUT NUMBER
 (1)  017024  000261                            SEC                     ;;SET "C" SO CAN KEEP TRACK OF THE NUMBER OF BITS
 (1)  017026  112737  000060  017070    1$:     MOVB    #'0,$BIN        ;;SET CHARACTER TO AN ASCII '0'.
 (1)  017034  006101                            ROL     R1              ;;GET THIS BIT
 (1)  017036  001406                            BEQ     2$              ;;DONE?
 (1)  017040  105537  017070                    ADCB    $BIN            ;;NO--SET THE CHARACTER EQUAL TO THIS BIT
 (1)  017044  104401  017070                    TYPE    ,$BIN           ;;GO TYPE THIS BIT
 (1)  017050  000241                            CLC                     ;;CLEAR "C" SO CAN KEEP TRACK OF BITS
 (1)  017052  000765                            BR      1$              ;;GO DO THE NEXT BIT
 (1)  017054  012601                    2$:     MOV     (SP)+,R1        ;;POP THE STACK INTO R1
 (1)  017056  016666  000002  000004            MOV     2(SP),4(SP)     ;;ADJUST THE STACK
 (1)  017064  012616                            MOV     (SP)+,(SP)
 (1)  017066  000002                            RTI                     ;;RETURN TO USER
 (1)  017070     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.

017072  010046                  $TRAP:  MOV     R0,-(SP)        ;;SAVE R0
017074  016600  000002                  MOV     2(SP),R0        ;;GET TRAP ADDRESS
017100  005740                          TST     -(R0)           ;;BACKUP BY 2
017102  111000                          MOVB    (R0),R0         ;;GET RIGHT BYTE OF TRAP
017104  006300                          ASL     R0              ;;POSITION FOR INDEXING
017106  016000  017126                  MOV     $TRPAD(R0),R0   ;;INDEX TO TABLE
017112  000200                          RTS     R0              ;;GO TO ROUTINE

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

017114  011646                  $TRAP2: MOV     (SP),-(SP)      ;;MOVE THE PC DOWN
017116  016666  000004  000002          MOV     4(SP),2(SP)     ;;MOVE THE PSW DOWN
017124  000002                          RTI                     ;;RESTORE THE PSW

                                .SBTTL  TRAP TABLE

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

                                ;       ROUTINE
                                ;       -------
017126  017114                  $TRPAD: .WORD   $TRAP2
017130  016040                          $TYPE   ;;CALL=TYPE     TRAP+1(104401)  TTY TYPEOUT ROUTINE
017132  016614                          $TYPOC  ;;CALL=TYPOC    TRAP+2(104402)  TYPE OCTAL NUMBER (WITH LEADING ZEROS)
017134  016570                          $TYPOS  ;;CALL=TYPOS    TRAP+3(104403)  TYPE OCTAL NUMBER (NO LEADING ZEROS)
017136  016630                          $TYPON  ;;CALL=TYPON    TRAP+4(104404)  TYPE OCTAL NUMBER (AS PER LAST CALL)
017140  017016                          $TYPBN  ;;CALL=TYPBN    TRAP+5(104405)  TYPE BINARY (ASCII) NUMBER

017142  014630                          $RDCHR  ;;CALL=RDCHR    TRAP+6(104406)  TTY TYPEIN CHARACTER ROUTINE
017144  014750                          $RDLIN  ;;CALL=RDLIN    TRAP+7(104407)  TTY TYPEIN STRING ROUTINE
017146  015122                          $RDOCT  ;;CALL=RDOCT    TRAP+10(104410) READ AN OCTAL NUMBER FROM TTY
017150  004102                          TEST    ;;CALL=CHECK    TRAP+11(104411)
017152  004074                          TESTIT  ;;CALL=CHKIT    TRAP+12(104412)
017154  011444                          DECTYP  ;;CALL=TYPDC    TRAP+13(104413)
```

```
                                        .EVEN
017156  000310                  DIST:   .BLKW   200.            ;STATE-WIDTH DISTRIBUTION
017776  010000                  BUFFER: .BLKW   4096.           ;BUFFER AREA

        000001                  .END
```

```
ABASE = 170400              23#    37     76     77     78
ACDW1 = 000000              37
ACDW2 = 000000              37
ACPUOP= 000000              37
ADBUFF  001322              78#   311    319    353    369*   379*   390    416*   442*   454    507*   511*   543
                           545    546    548    727    782*   796*   798*   837*   863*   876    909*   915    921
                           983   1237
ADDW0 = 000000              37
ADDW1 = 000000              37
ADDW10= 000000              37
ADDW11= 000000              37
ADDW12= 000000              37
ADDW13= 000000              37
ADDW14= 000000              37
ADDW15= 000000              37
ADDW2 = 000000              37
ADDW3 = 000000              37
ADDW4 = 000000              37
ADDW5 = 000000              37
ADDW6 = 000000              37
ADDW7 = 000000              37
ADDW8 = 000000              37
ADDW9 = 000000              37
ADEVCT= 000000              37
ADEVM = 000000              37
ADST1   001320              77#   781*   795*   797*   911*
AENV  = 000000              37
AENVM = 000000              37
AFATAL= 000000              37
AGAIN   007450              967#  1003
AGATST  011636             1354#  1358
AGTST   011646              748*   764*   773*  1356#
AJGAIN  005510              666    683#
AJOFF   005436              664    670#
AMADR1= 000000              37
AMADR2= 000000              37
AMADR3= 000000              37
AMADR4= 000000              37
AMAMS1= 000000              37
AMAMS2= 000000              37
AMAMS3= 000000              37
AMAMS4= 000000              37
AMSG    012051              137   1365#
AMSGAD= 000000              37
AMSGLG= 000000              37
AMSGTY= 000000              37
AMTYP1= 000000              37
AMTYP2= 000000              37
AMTYP3= 000000              37
AMTYP4= 000000              37
APASS = 000000              37
APRIOR= 000200              25#    37     80
APTCSU= 000040             1463   1464#
APTENV= 000001             1460   1463   1464#
APTSIZ= 000200              163   1464#
APTSPD= 000100             1463   1464#
```

```
AROUND  007602          1002#
ASKCH   013705          1418#
ASWREG= 000000            37
ATESTN= 000000            37
ATMSG   012176           834    1375#
AUNIT = 000000            37
AUSWR = 000000            37
AVECT1= 100400            24#     37      79      81      82      83
AVECT2= 000000            37
BASEBR  001326            80#    801*    802*
BASECH  001342            86#    520     521     836     961    1225
BEGIN   001644            30     159#   1356
BEGINA  006066           211     752#
BEGINC  005364           214     656#
BEGINL  002670           269#    745     754
BEGINP  005640           217     708#
BEGINW  006150           223     768#
BEGIN2  001652            32     161#
BEGL    006030           198     220     743#
BEG2    002262            31     134     194#    682     705
BITPNT  001422           110#    905*    908     928     929*
BIT0  = 000001            21#    316     402     431     435     445     446     447
BIT00 = 000001            21#
BIT01 = 000002            21#
BIT02 = 000004            21#
BIT03 = 000010            21#
BIT04 = 000020            21#
BIT05 = 000040            21#
BIT06 = 000100            21#
BIT07 = 000200            21#
BIT08 = 000400            21#    1459
BIT09 = 001000            21#    1459    1460
BIT1  = 000002            21#
BIT10 = 002000            21#    1460
BIT11 = 004000            21#    1459
BIT12 = 010000            21#     276     311     319    1185
BIT13 = 020000            21#     716     728    1460
BIT14 = 040000            21#     280     420     422    1459
BIT15 = 100000            21#     324     339     350     420     422     434     444    1352
BIT2  = 000004            21#     299
BIT3  = 000010            21#     304     316
BIT4  = 000020            21#     295
BIT5  = 000040            21#     290
BIT6  = 000100            21#     285     402     406     722
BIT7  = 000200            21#     347     406     434
BIT8  = 000400            21#     272
BIT9  = 001000            21#     345     436
BPTVEC= 000014            21#
BUFFER  017776           944     988*    990*   1005    1033    1099    1111    1113    1133    1145    1146    1147    1169
                        1172    1477#
BUFF1   014026          1082    1426#
BUFF2   014054          1168    1427#
BUFPAD  006206           746     762     771     777#
BYPASS  006472           789     812#
B10     011374          1296#   1297
B11     011430          1306#   1307
```

```
CCHAN   012256            656  1381#
CH      012131            718  1371#
CHAN    012213           1212  1377#
CHANL   001372             98#  374*  385*  520*  564*  565  583*  584  586*  587  594*  658*  659
                           864  916  1213  1226*  1451
CHANNL  007412            960#
CHECK = 104411            342  351  361  370  439  1471#
CHKIT = 104412            273  281  286  291  296  300  305  325  1472#
CH1     001360             93#  592*  604  606  607*  833  835  853
CH2     001362             94#  593*  594  607  608*  829  849
CLEAR1  007340            946#  948
CLEAR2  007404            957#  959
CMSG    012056            131  1366#
COMPAR  011150            475  482  490  498  515  525  552  557  649  1247#
CONV    007002            874#  878
CONVR   007506            978  980#
CONVRT  011036            473  480  488  496  508  512  838  1224#
CR    = 000015             21#  1463
CRLF  = 000200             21#  1463
CRMR    012456            674  684  689  1387#
C0      013744            170  1419#
C2      013747           1091  1174  1420#
C3      013754           1171  1421#
DAC     001414             107#  571  574  577  580  620  624  694  698  852  856  906*  908*
                           909  928*
DASH    012105           1036  1369#
DDISP = 177570             21#  37  163
DECPNT  014562           1042*  1071*  1445#
DECTYP  011444           1313#  1473
DELAY   001416             108#  640*  644*  965*  1002*
DELAY1  007560            984  995#
DELAY2  007566            986  996  997#
DELAY3  007504            979#
DELAY4  007302            792  935#  936
DELCLR  010646           1080  1092  1175  1185#
DF1     014626             54  61  67  73  1453#
DH1     014407             52  1441#
DH2     014443             71  1442#
DH3     014526             59  65  1443#
DIFLIN  007310            614  940#
DISPLA  001142              37#  163*  730*  1459*  1460*
DISPRE  000174              30#  163
DIST    017156            949  1016*  1083  1476#
DONE    012230           1275  1378#
DSWR  = 177570             21#  37  163
DT1     014566             53  1450#
DT2     014600             72  1451#
DT3     014616             60  66  1452#
DUMC    011270            408  415  424  427  1271#
DUMMY   001370              97#  521*  565*  659*  849*  853*  911
DUMW    011216            396  418  1261#
EDGE    001420             109#  617*  621*  691*  695*  871*  876*  879*  880*  881*  882*  886  921
EDGFLG  007106            581*  602*  888  894#
EMTVEC= 000030              21#  163*
EM1     014267             51  1436#
EM2     014311             58  1437#
```

```
EM3     014335            64    1438#
EM4     014362            70    1439#
ER      011030          1215    1217    1220#
ERMSG   012567           530     845    1048    1063    1075    1128    1220    1391#
ERR     006660           842     845#
ERRVEC= 000004            21#    163*     249     250*    265*    791*   1459*
FIRST   001352            90#    955*    1028    1030*
FIXADR  006304           778     790#
FIXONE  006310           187     791#
FLAG    001410           105#    165*     182*   1078    1131
GETDAT  010424          1136#   1144
GETEDG  006730           566     595     863#
GMSG    012063           145    1367#
GNS   = ****** U          30    1358    1470    1471    1472    1473
GUNITS  001436           116#    239*     254*   1358    1460*
HAFMSG  012757          1072    1397#
HALF    010110          1064    1066#
HEAD1   014107           185    1430#
HEAD5   013665           710    1416#
HT    = 000011            21#   1463
HUNS    014561          1322*   1334*   1336*   1339    1444#
IGND    012417           670    1386#
INRNGE  007646          1012    1015#
IOTVEC= 000020            21#    163*
ISERV   001464           126#    189
IVOLT   012505           683    1388#
KBVECT  001344            87#    188     814
LAST    007762          1026    1040#
LEND    005156           613     615#
LESS    011362          1291    1293#
LF    = 000012            21#   1463
LINEA   013644          1121    1415#
LOAD    010624          1170    1173    1177#
LOADY   011342          1086    1088    1180    1287#
LOAD0   010630          1178#   1182
LO2     010622          1132    1176#
LSB     012141           828    1373#
LSBMSG  012076          1038    1368#
MAT     013777           830    1424#
MAX     001430           113#   1152*    1157    1159*   1163
MAXTST  010522          1155    1157#
MEND    013057           755    1400#
MESP    013041          1210    1399#
MESR    013026          1207    1398#
METST   014004          1265    1425#
MIN     001424           111#   1151*    1154    1156*   1162
MINUS   012045           891    1315    1363#
MLSB    013771           632    1423#
MOFSET  013756           523    1422#
MSG16   013234          1081    1409#
MSG18   013142          1167    1403#
MSG20   013202           940    1407#
MSG21   013617          1098    1414#
MSG50   013121           262    1402#
MSG71   013561           201    1413#
MOLSB   012373           688    1385#
```

```
NAR     010026            1049    1051#
NARMSG  012626            1053    1393#
NARROW  001350              89#    954*   1020*   1051    1066
NBEXT   001364              95#    251*    253*    261     263*    264     777     788*    810*
NEXT    007454             968#   1001
NMBEXT  001366              96#    264*    810
NOI     012203            1198    1376#
NOIMSG  012004             563    1361#
NONE    001636             142     144    155#
NOTNAR  007702            1019    1025#
NOTNEW  010316            1108    1113#
NOTOK   007552             993#    999
NOVT55  002212             173     176    181     185#    233
NXTCMP  010506            1153#   1161
NXTCVT  007170             911#    925
NXTSTA  010260            1100#   1114
NXTY1   010214            1085#   1090
NXT8    010470            1149#   1166
OFFERR  004464             528     530#
OFFOK   004472             529     532#
OFFSET  005160             522     617#    676
OKAY    007576             989     991    994     1000#
OKAYD   011470            1318    1320#
OKMSG   012245             532     843    1050    1065    1077    1130    1218    1380#
ONAD    013103            1267    1401#
ONES    014564            1320*   1326*  1327    1329*   1338*   1447#
OUT     001434             115#    952*  1013*   1055    1058    1061    1068
OUTMSG  012724            1060    1395#
PEAK    001406             104#    568*   577*    580*   1202    1204*   1208    1216
PERCNT  001432             114#    900*   901*    902*    903*    904*    926
PIRQ  = 177772              21#
PIRQVE= 000240              21#
PLUS    010300            1105    1107#
PLUSR2  011350            1288    1290#
POPRO   001616             150#    156
POS     011456            1314    1317#
POSITV  012565             630    1390#
POSPEA  010736            1203    1205#
POSRMS  010724            1200    1202#
PR0   = 000000              21#
PR1   = 000040              21#
PR2   = 000100              21#
PR3   = 000140              21#
PR4   = 000200              21#
PR5   = 000240              21#
PR6   = 000300              21#
PR7   = 000340              21#
PS    = 177776              21#
PSW   = 177776              21#
PWRVEC= 000024              21#
QUEST   012047             155     224    1364#
RBEG    001660             160     162#
RDCHR = 104406            1455    1470#
RDLIN = 104407             202     661     671     685    1457    1470#
RDOCT = 104410             148     657    1470#
READ    007620            1006#   1041
```

```
RELACC  010244  1079  1096#
REST1   002216   167   186#
RESVEC= 000010    21#   792*
RET     007104   889   893#
RETERR  004124   464   466#
RETURN  001620   151#   720   873   912  1233
RET1    001630   153#   966
RET2    001634   152   154#
RMS     001404   103#   567*  571*  574* 1199  1201* 1205  1214
RNA     001376   100#   191*  941
RNB     001400   101#   192*  942
RNC     001402   102#   193*  943
RST     011320   133   139  1279#
SARSUB  007110   569   572   575   578   618   622   692   696   850   854   900#
SAR1    007134   905#
SEL     012304   660  1382#
SETCH   012154   832  1374#
SETMSG  012023   591  1362#
SET1A   006666   597   598   849#
SHIFT   007272   927   929#
SKIPST  001354    91#   956*  1023* 1043  1046
SKPMSG  012604  1045  1392#
SLASH   012243   147  1123  1379#
SPACE   012134   639   732  1372#
SPREAD  001412   106#   375*  386*  1248* 1255  1451
STACK = 001100    21#   132   138   163   194
STATE   012111  1031  1370#
STKLMT= 177774    21#
STREG   001316    76#   308*  309   316*  317   329*  332   339*  346*  350*  357*  358   366*
                 367   376*  377   387*  388   402*  403   405   420*  421   428*  431*  432
                 435*  445*  446*  447*  448   455*  461*  462   538*  540*  541   709*  723*
                 725*  756   780*  794*  867*  874*  913*  919*  964*  980*  1229* 1235* 1268
                1450  1451  1452
SWDIST  010162  1076  1078#
SWR     001140    37#   143   146   149*  163*  714   716   728  1185  1459  1460
SWREG   000176    30#   163
SW0   = 000001    21#
SW00  = 000001    21#
SW01  = 000002    21#
SW02  = 000004    21#
SW03  = 000010    21#
SW04  = 000020    21#
SW05  = 000040    21#
SW06  = 000100    21#
SW07  = 000200    21#
SW08  = 000400    21#
SW09  = 001000    21#
SW1   = 000002    21#
SW10  = 002000    21#
SW11  = 004000    21#
SW12  = 010000    21#
SW13  = 020000    21#
SW14  = 040000    21#
SW15  = 100000    21#
SW2   = 000004    21#
SW3   = 000010    21#
```

```
SW4    = 000020            21#
SW5    = 000040            21#
SW6    = 000100            21#
SW7    = 000200            21#
SW8    = 000400            21#
SW9    = 001000            21#
TADDR    001374            99#   140    708*   743*   752*   768*
TBITVE= 000014             21#
TCHK     005256           634#   678    701
TEMP     001356            92#   241*   244*   247*   256*   510    514*   551*   556*   620*   624*   625*   628
                           69#*  698*   699*   840    993*   998*  1228*  1237*  1240*  1241*  1242*  1243*  1249
TENS     014563          1321*  1330*  1331   1333*  1337*  1446#
TEST     004102           462#  1471
TESTAD   002464           238#   744    753    769
TESTIT   004074           461#  1472
TESTR2   011504          1323#  1328   1332   1335
TKVEC  = 000060             21#
TOFF     005234           524    628#   677    700
TPVEC  = 000064             21#
TRAPVE= 000034              21#   163*
TRTVEC= 000014              21#
TRY      007146           907#   930
TRYAG    002314           202#   225
TSTBIT   001440           117#   240*   254    255*   266*   779*   793*  1460
TST1     002670           270#   271
TST10    003050           307#
TST11    003100           312    315#
TST12    003130           320    323#
TST13    003144           327#
TST14    003210           333    337#
TST15    003242           344#
TST16    003304           355#
TST17    003346           365#
TST2     002732           279#
TST20    003372           372#   425
TST21    003436           380    383#
TST22    003514           392    395#
TST23    003642           409    417#
TST24    003726           430#
TST25    004000           443#
TST26    004126           470#   471    472
TST27    004176           479#
TST3     002746           283#
TST30    004226           487#
TST31    004256           494#
TST32    004330           506#
TST33    004410           519#
TST34    004476           531    534#
TST35    004624           562#
TST36    005010           590#
TST37    005134           605    611#
TST4     002770           289#
TST5     003004           294#
TST6     003020           298#
TST7     003034           303#
TST8     010534          1158   1160#
```

```
TYPBAD  007714          1014    1024    1028#
TYPBN = 104405          1358    1470#
TYPDC = 104413           631     827    1037    1044    1052    1056    1059    1070    1120    1206    1209    1473#
TYPE  = 104401           131     137     145     147     155     170     185     201     224     262     523     530     532
                         563     591     630     632     637     639     656     660     667     670     673     674     683
                         684     687     688     689     710     718     732     739     755     760     828     830     832
                         834     843     845     891     940    1031    1036    1038    1045    1048    1050    1053    1057
                        1060    1063    1065    1072    1075    1077    1081    1082    1091    1098    1121    1123    1128
                        1130    1167    1168    1171    1174    1195    1198    1207    1210    1212    1218    1220    1265
                        1267    1275    1315    1339    1358    1455    1460    1461    1463    1466    1468    1470#
TYPEDG  007044           831     886#    1211
TYPOC = 104402          1461    1470#
TYPON = 104404          1470#
TYPOS = 104403           146     261     719     733     757     829     833     840     887     892    1035    1122    1125
                        1213    1266    1268    1470#
TYPOUT  011560          1324    1336#
TYPRP   010706           582    1198#
TYPSET  006536           603     827#
UNEXP   001442           119#    284     411
VADR    001336            84#    258     780     781     782
VECTOR  001324            79#    284*    400*    411*    720*    783*    799*    800*    803     805     807     873*    912*
                          966*   1233*
VECTR1  001330            81#    401*    784*    787*    803*    804*    809*
VECTR2  001332            82#    419*    785*    805*    806*
VECTR3  001334            83#    786*    807*    808*
VLIN    011632          1126    1351#
VNP     011626          1216    1349#
VNR     011624          1214    1348#
VSET    011630           841    1350#
VTFLG   002432           171     174     177     227#
VTINIT  014074          1195    1428#
VT55    002206           179     182#
VVCT    001340            85#    783     784     785     786
V0      011610           554     559    1341#
V12     011616           477     500    1344#
V2      011612           517    1342#
V326    011622           484     492    1346#
V4      011614           651    1343#
V50D    011620           527    1345#
WFTEST  001426           112#    159*    161*    199     245
WIDE    001346            88#    953*   1027*   1054    1067
WIDMSG  012665          1057    1394#
WRAP    004126           469#    761     770
XADJ    012357           673    1384#
YADJ    012551           687    1389#
$APTHD  001000            36#
$ASTAT= ****** U        1464
$ATYC   016346          1464#
$ATY1   016322          1464#
$ATY3   016330          1463    1464#
$ATY4   016340          1460    1464#
$AUTOB  001134            37#
$BASE   001250            37#    248     794     795     796
$BDADR  001122            37#
$BDDAT  001126            37#    248*    252     258*    332*    379*    390*    391     405*    421*    448*    449*    450
                          462*   463    1249*   1250    1450    1451    1452
```

```
$BELL   001164            37#   1460
$BIN    017070          1468#*
$CDW1   001254            37#
$CHARC  016316          1463#*
$CKSWR= ****** U        1470
$CMTAG  001100            37#    163
$CM3  = 000000            37#
$CNTLG  015073          1455#
$CNTLU  015066          1455#
$CPUOP  001222            37#
$CRLF   001171            37#    637     739     760    1455    1460    1461    1463
$DEVCT  001204            37#
$DEVM   001252            37#
$DOAGN  011774          1358#
$ENDAD  011764            34   1358#   1460
$ENDCT  011704           163   1358#
$ENULL  012000          1358#
$ENV    001214            37#   1460    1463    1464
$ENVM   001215            37#    163     242    1463    1464
$EOP    011650           749    765     774    1358#
$EOPCT  011676          163*   1358#
$ERFLG  001103            37#    120*   1459*   1460*
$ERMAX  001115            37#    163*   1459*
$ERROR  015502           163   1460#
$ERRPC  001116            37#   1450    1451    1452   1460*   1461
$ERRTB  001256            37#   1461
$ERRTY  015704          1460    1461#
$ERTTL  001112            37#   1460*
$ESCAP  001162            37#    119*    122*    163*   1459*   1460
$ETABL  001214            37#
$ETEND  001256            36     37#
$FATAL  001176            37#   1464*
$FFLG   016566          1464#*
$FILLC  001156            37#   1463
$FILLS  001155            37#   1463
$GDADR  001120            37#
$GDDAT  001124            37#    272*    275*    276     280*    285*    290*    295*    299*    304*    324*    328*    347*
                        356*    373*    384*    391     406*    422*    434*    444*    450     461     463    1247*   1251
                       1450    1451
$GET42  011754          1358#
$GTSWR= ****** U        1470
$HD   = 000000            20
$HIBTS  001000            36#
$HIOCT  015222          1457#*
$ICNT   001104            37#   1459*
$INTAG  001135            37#
$ITEMB  001114            37#   1460*   1461
$LF     001172            37#   1455    1460    1463
$LFLG   016565          1464#*
$LPADR  001106            37#    163*    270*    472*   1264*   1274*   1459*
$LPERR  001110            37#    163*    271*    471*   1263*   1273*   1459*   1460
$MADR1  001226            37#
$MADR2  001232            37#
$MADR3  001236            37#
$MADR4  001242            37#
$MAIL   001174            36     37#    163    1459    1460    1463
```

```
$MAMS1  001224            37#
$MAMS2  001230            37#
$MAMS3  001234            37#
$MAMS4  001240            37#
$MBADR  001002            36#
$MFLG   016564          1464#*
$MNEW   015111          1455#
$MSGAD  001210            37#   1464*
$MSGLG  001212            37#   1464*
$MSGTY  001174            37#   1464*
$MSWR   015100          1455#
$MTYP1  001225            37#
$MTYP2  001231            37#
$MTYP3  001235            37#
$MTYP4  001241            37#
$MXCNT  015500          1459#
$NULL   001154            37#   1463
$NWTST= 000001           270#   279#   283#   289#   294#   298#   303#   307#   315#   323#   327#   337#   344#
                         355#   365#   372#   383#   395#   417#   430#   443#   470#   479#   487#   494#   506#
                         519#   534#   562#   590#   611#
$OCNT   017012          1466#*
$OMODE  017014          1466#*
$OVER   015464          1459#
$PASS   001202            37#   163*   238*   612    1261   1271   1358*  1459
$PASTM  001006            36#
$QUES   001170            37#   667    1455   1460   1463
$RDCHR  014630          1455#   1470
$RDDEC= ****** U        1470
$RDLIN  014750          1455#   1470
$RDOCT  015122          1457#   1470
$RDSZ = 000010          1455#
$RTNAD  011776          1358#
$R2A  = ****** U        1470
$SAVRE= ****** U        1470
$SCOPE  015224           163    1459#
$SETUP= 000027            38#   163    1358   1455   1459   1460
$STUP = 177777            38#
$SVLAD  015430          1459#
$SVPC = 000214            34#
$SWR  = 167400             5#    20     22     37     163    270    279    283    289    294    298    303    307
                         315    323    327    337    344    355    365    372    383    395    417    430    443
                         470    479    487    494    506    519    534    562    590    611    1358   1459   1460
$SWREG  001216            37#   163
$SWRMK= 000000            22    1459
$TESTN  001200            37#   1459*
$TIMES  001160            37#   163*   327*   338*   355*   470*   479*   487*   494*   506*   519*   535*   562*
                         590*   611*   1358*  1459*
$TKB    001146            37#   127    234    647    1455
$TKS    001144            37#   169*   203*   228    331*   341*   363*   641*   642    648*   1280*  1354*  1455
$TN   = 000040             6#    20     270#   279#   283#   289#   294#   298#   303#   307#   312    315#   320
                         323#   327#   333    337#   344#   355#   365#   372#   380    383#   392    395#   396
                         409    417#   418    430#   443#   470#   479#   487#   494#   506#   519#   531    534#
                         562#   590#   605    611#
$TPB    001152            37#   1298*  1308*  1463*
$TPFLG  001157            37#   1463
$TPS    001150            37#   1296   1306   1463
```

```
$TRAP   017072            163    1470#
$TRAP2  017114           1470#
$TRP  = 000014           1470#   1471#   1472#   1473#
$TRPAD  017126           1470#
$TSTM   001004             36#
$TSTNM  001102             37#    470*   1358*   1459*   1460
$TTYIN  015056           1455#
$TYPBN  017016           1468#   1470
$TYPDS= ****** U         1470
$TYPE   016040           1463#   1464    1470
$TYPEC  016252           1463#
$TYPEX  016320           1463#
$TYPOC  016614           1466#   1470
$TYPON  016630           1466#   1470
$TYPOS  016570           1466#   1470
$UNIT   001206             37#
$UNITM  001010             36#
$USWR   001220             37#
$VECT1  001244             37#    799     801
$VECT2  001246             37#
$XTSTR  015234           1459#
$$GET4= 000000           1358#
$OFILL  017013           1466#*
$40CAT= ****** U         1459    1460
.     = 037776             27#     30#     34#     35#     36#     37#    163    1358#   1455#   1459    1460    1461#   1463
                         1464#   1476#   1477#
.$ASTA= ****** U         1464
.$X   = 001000             36#
```

```
BERROR      16#   1460
COMMEN      21#
DUMWRN      42#    396    418
ENDCOM      21#
ENDPAS      11#   1358
ERROR       21#    121    274    282    287    292    297    301    306    313    321    326    334    343    352
           362    371    381    393    407    423    440    452    478    485    493    501    518    555    560
ESCAPE      21#    119
GETPRI      21#
GETSWR      21#
MULT        21#
NEWTST      21#    270    279    283    289    294    298    303    307    315    323    327    337    344    355
           365    372    383    395    417    430    443    470    479    487    494    506    519    534    562
           590    611
POP         21#   1457   1464
PUSH        21#   1457   1464
REPORT      21#
SCOPE       21#    279    283    289    294    298    303    307    315    323    327    337    344    355    365
           372    383    395    417    430    443    456    479    487    494    506    519    534    562    590
           611
SETPRI      21#
SETTRA    1470#   1471   1472   1473
SETUP       21#    163
SKIP        21#    200    210    213    216    219    222    229    231    233    243    246    257    259    277
           310    312    318    320    333    380    392    409    451    464    504    531    585    588    605
           609    629    635    638    643    645    646    652    664    666    668    679    680    702    703
           717   1186   1188
SLASH       21#
SPACE       21#
STARS       21#     34     36     37    270    279    283    289    294    298    303    307    315    323    327
           337    344    355    365    372    383    395    417    430    443    470    479    487    494    506
           519    534    562    590    611   1358   1455   1457   1459   1460   1461   1463   1464   1466   1468
          1470
SWRSU       21#   163#
TRMTRP    1470#
TYPBIN      21#   1358
TYPDEC      21#
TYPNAM      21#
TYPNUM      21#
TYPOCS      21#    146    261    719    733    829    833    840    887    892   1035   1122   1125   1213   1266
          1268
TYPOCT      21#   1461
TYPTXT      21#   1358
$$CMRE      37#
$$CMTM      37#
$$ESCA      21#
$$NEWT      21#    270    279    283    289    294    298    303    307    315    323    327    337    344    355
           365    372    383    395    417    430    443    470    479    487    494    506    519    534    562
           590    611
$$SET     1470#   1471   1472   1473
$$SETM      163#
$$SKIP      21#    312    320    333    380    392    409    531    605
.EQUAT       7#     21
.HEADE       7#     20
.SETUP       9#     38
.SWRHI       9#     22
```

```
.SWRLO     22#
.$ACT1     10#     34
.$APTB     10#     37#
.$APTH     10#     36
.$APTY     10#   1464
.$CATC      7#     30
.$CMTA      7#     37
.$EOP       7#   1358
.$ERRO      7#   1460
.$ERRT      9#   1461
.$PARM      8#
.$POWE      8#
.$RAND     10#
.$RDOC     10#   1457
.$READ      8#   1455
.$SAVE      8#
.$SCOP      8#   1459
.$SPAC      9#
.$SWDO      9#
.$TRAP      9#   1470
.$TYPB      8#   1468
.$TYPD     10#
.$TYPE      9#   1463
.$TYPO      8#   1466

. ABS.  037776     000

 ERRORS DETECTED:  0

 CVADAB,CVADAB/CRF=CVADAB
 RUN-TIME: 28 11 1 SECONDS
 RUN-TIME RATIO: 326/41=7.8
 CORE USED:  26K  (51 PAGES)
```

C	1		K	5	MAINDE
D	1		L	5	MAINDE
E	1		M	5	MAINDE
F	1		N	5	MAINDE
G	1		B	6	MAINDE
H	1		C	6	MAINDE
I	1		D	6	MAINDE
J	1		E	6	MAINDE
K	1	MAINDE	F	6	MAINDE
L	1	MAINDE	G	6	MAINDE
M	1	MAINDE	H	6	MAINDE
N	1	MAINDE	I	6	MAINDE
B	2	MAINDE	J	6	MAINDE
C	2	MAINDE	K	6	MAINDE
D	2	MAINDE	L	6	MAINDE
E	2	MAINDE	M	6	MAINDE
F	2	MAINDE	N	6	MAINDE
G	2	MAINDE	B	7	MAINDE
H	2	MAINDE	C	7	MAINDE
I	2	MAINDE	D	7	MAINDE
J	2	MAINDE	E	7	MAINDE
K	2	MAINDE	F	7	MAINDE
L	2	MAINDE	G	7	MAINDE
M	2	MAINDE	H	7	MAINDE
N	2	MAINDE	I	7	MAINDE
B	3	MAINDE	J	7	MAINDE
C	3	MAINDE	K	7	MAINDE
D	3	MAINDE			
E	3	MAINDE			
F	3	MAINDE			
G	3	MAINDE			
H	3	MAINDE			
I	3	MAINDE			
J	3	MAINDE			
K	3	MAINDE			
L	3	MAINDE			
M	3	MAINDE			
N	3	MAINDE			
B	4	MAINDE			
C	4	MAINDE			
D	4	MAINDE			
E	4	MAINDE			
F	4	MAINDE			
G	4	MAINDE			
H	4	MAINDE			
I	4	MAINDE			
J	4	MAINDE			
K	4	MAINDE			
L	4	MAINDE			
M	4	MAINDE			
N	4	MAINDE			
B	5	MAINDE			
C	5	MAINDE			
D	5	MAINDE			
E	5	MAINDE			
F	5	MAINDE			
G	5	MAINDE			
H	5	MAINDE			
I	5	MAINDE			